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ABSTRACT

This program guide has been developed to provide information that will be useful to local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibility of offering vocational education programs in Florida. It identifies the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program. The first section of the guide, concerning legal authority, relates to vocational education programs in general. The remaining four sections relate specifically to the basic precision machining and precision machining programs. Those sections contain information on program content, student admissions and teacher standards, facilities, and instructor resources. Appendixes to the guide provide facilities diagrams, organization charts for Vocational Industrial Clubs of America, and curriculum frameworks and student performance standards for basic precision and precision machining. (KC)

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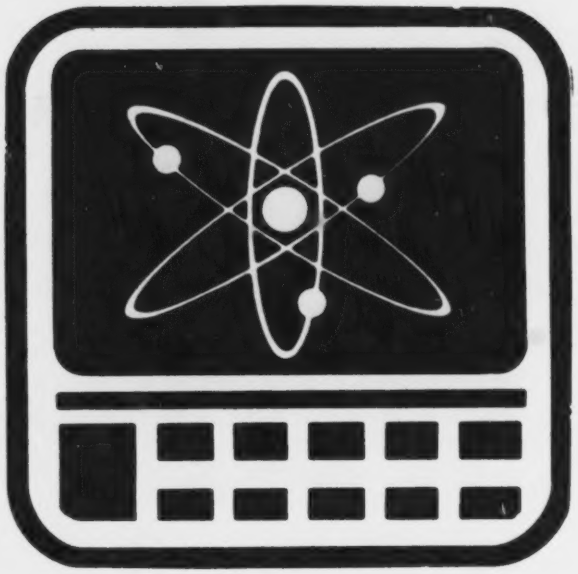
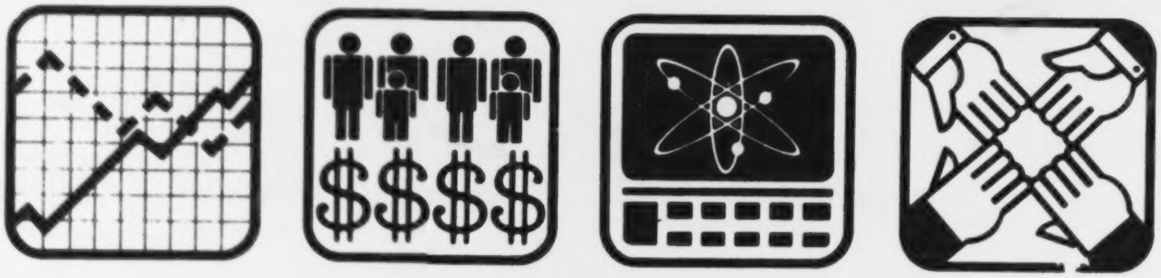


# FLORIDA VOCATIONAL PROGRAM GUIDE FOR

## Basic Precision Machining
## Precision Machining



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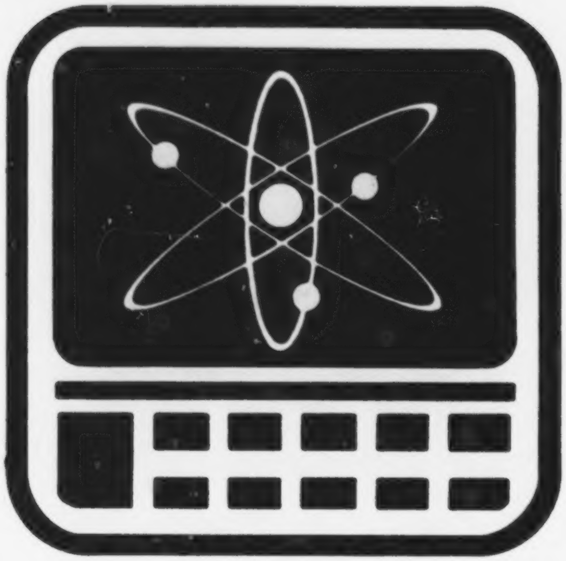

# FLORIDA VOCATIONAL PROGRAM GUIDE FOR

# Basic Precision Machining
# Precision Machining

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Bureau of Vocational Program and Staff Development

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## INTRODUCTION

This Program Guide has been developed to provide information that will be useful to local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibilty of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

The Legal Authority sections of the Guide relate to vocational education programs in general. The remaining sections relate specifically to the vocational education program course for which the Guide is designed.

Vocational education has evolved to meet the needs of students desiring to pursue a selected vocation. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. In order to do this, it is necessary both to create exemplary vocational programs and to make those programs consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship between Florida institutions offering similar or related courses and programs. The rule states, in part, that:

> When a student tranfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged ... to be equivalent to courses offered at the receiving institution.

This Program Guide helps ensure that equivalency. Throughout Florida, vocational programs, if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

## LEGAL AUTHORITY

### Program Standards

Vocational education programs are established pursuant to Florida Statutes (hereafter F.S.) and enabling Administrative Rules adopted by the Florida State Board of Education (hereafter S.B.E.).

Section 233.0682 F.S.: State Board regulations states:

> The State Board of Education shall adopt regulations setting forth minimum requirements for a comprehensive vocational education program, and shall adopt procedures for determining the extent to which such minimum requirements are being met. Such requirements shall include examination of the employment performance of program participants as well as standards of educational output, with particular emphasis on job placement and satisfactory performance in employment.

This statute is administered by S.B.E. Administrative Rule 6A-6.21: Comprehensive Vocational Education Program; definition, which states, in part, that:

> the term comprehensive vocational education shall include occupational education programs not leading to a bachelor's degree. A comprehensive vocational education program is one which provides vocational programs, services and activities of high quality, realistic in light of actual or anticipated opportunities for gainful employment and suited to the needs, interests, and abilities of the persons to be served.

For the purpose of defining the vocational education programs administered by community colleges within the state, the Division of Community Colleges has adopted S.B.E. 6A-14.34 to implement 240.355 F.S.: State Board of Education Rules, which authorizes "each community college district board of trustees to initiate and provide comprehensive vocational education programs." (NOTE: S.B.E. Rule 6A-14.34 is identical to S.B.E. Rule 6A-6.621 [see above], except that all S.B.E. Chapter 6A-14 rules refer to Division of Community College-sponsored programs, while S.B.E. Chapter 6A-6 rules refer to programs sponsored by the Division of Vocational, Adult, and Community Education.)

S.B.E. Rule 6A-6.571: Criteria for qualification of special vocational-technical education program courses, provides for the annual publication of Vocational Education Program Courses Standards. These course standards for each vocational education program are approved by the Florida State Board of Education and published by the Division of Vocational, Adult, and Community Education.

The Program Course Standards provide program descriptions and statements of program objectives that must be adhered to by the school districts in offering vocational programs. The extent to which these Standards are adhered to forms the basis for program review and evaluation.

Special funding provisions for vocational programs are determined in relation to all other education programs under Section 236.081 F.S.: Funds for the operation of schools.

## Program Planning

The Vocational Education Planning Process, published in 1980 by the Division of Vocational Education, outlines the procedures local education agencies should follow in developing and submitting their five-year and annual plans for the operation of vocational education programs.

The legal basis for program planning is found in Section 229.55 F.S.: Educational Accountability Act of 1976, and 299.555 F.S.: Educational planning and information systems. These statutes address various aspects of the process of planning effective instructional programs at each level—from the local school district to the state level. These Florida Statutes are implemented by S.B.E. 6A-6.67: Coordinating Council for vocational education, adult general education, and community instructional services, S.B.E 6A-6.70: Direct job-related vocational offerings required for each school district, and S.B.E. 6A-6.71: Student services.

School districts are encouraged to utilize the resources and support of business, industry, and the community in planning vocational programs. A portion of S.B.E. Rule 6A-6.67, which has particular implications for planning for specific vocational programs in specific schools, follows:

> The responsibilities of the [coordinating] council shall be to review the total vocational education, adult general education, and community instructional services program being offered in the district, to make such recommendations as are necessary, to encourage the development of needed offerings or changes in existing offerings and to avoid unwarranted duplications.

(S.B.E. Rule 6A-14.37 addresses this topic in identical language for community college programs.)

## Program Structure

The legal basis for Florida's comprehensive vocational education structure may be found in S.B.E. Rules 6A-6.621 and 6A-14.34: Comprehensive vocational education, definition; 6A-6.63 and 6A-14.343: Scope of vocational education; 6A-6.64 and 6A-14.344: Types of vocational education courses and activities; and 6A-6.65 and 6A-14.345: Instructional components of vocational education.

Perhaps the legal basis for Florida's comprehensive vocational program is stated best in S.B.E. Rules 6A-6.65 and 6A-14.345. These rules define the components of vocational education instruction, beginning with introduction to the world of work in grades 1-6; exploratory experiences in grades 7-9; job-related experiences and prevocational training instruction in grades 10-12; and adult-level training and retraining programs. Special needs of disadvantaged and handicapped individuals at all levels—grade 1 through adults—are considered and provided for. Based upon these rules, Florida has developed a statewide comprehensive vocational program that is recognized as one of the best in the nation.

## Program Development

Vocational program development is geared to meet the needs of Florida's employers and students. The vocational planning process incorporates information from business and industry, including data on employers' needs and on emerging trends and changes in technological processes. Legal basis is provided by S.B.E. Rules 6A-6.64 and 6A-14.344, both entitled **Types of vocational education courses and activities**, for the development of the many vocational courses and programs that must be offered to meet the needs of employers and students. These rules will be amended in the future to bring them more into conformity with 1983 legislation.

Section 228.041 F.S. defines vocational education as follows:

> (22) "Vocational education" is defined as meaning that instruction not leading to a baccalaureate degree, either graded or ungraded, listed below:
>
> (a) Job-preparatory instruction in the minimum competencies necessary for effective entry into an occupation, including diversified cooperative education, work experience, and job entry programs which coordinate directed study and on-the-job training;
>
> (b) Exploratory courses designed to give students initial exposure to the skills and aptitudes associated with a broad range of occupations in order to assist them in making informed decisions regarding their future academic and occupational goals;
>
> (c) Supplemental programs designed to enable persons who are or have been employed in a specific occupation to upgrade their competencies in order to re-enter or maintain stability or advance within their occupation; or

(d) Practical arts courses designed to teach students practical generic skills which, though applicable to some occupations, are not designed to prepare students for entry into specific occupations. Such courses may include, but may not be limited to, typing, industrial arts, and home economics.

Program development is based largely on identifying and meeting the requirements of employers and credentialling agencies. Significant input is sought from advisory groups, ad hoc committees, and task forces made up of representatives from business and industry and instructional, supervisory, and administrative personnel. The Division of Vocational, Adult, and Community Education, the school districts, and community colleges work together to develop programs with objectives that are consistent with employers' requirements.

Educational standards are established for program development. Using these standards as guides and guidelines, effective programs are developed that meet the goals of vocational education, particularly the major goal of preparing students for entry-level employment. These standards are grouped into three categories: input, process, and product. First, standards of input govern requirements for teachers, facilities, and materials. Second, standards of process help determine requirements for instruction, curriculum selection, placement, and evaluation. And third, standards of product are determined by the number and degree of competencies students achieve and by the placement of trained students in jobs.

## Program Review and Evaluation

The primary purpose of program review is program improvement. To accomplish this purpose, a review of each vocational program is necessary to determine those areas in which program improvement can be implemented most effectively.

The legal basis for program review is found in Chapter 229.565 F.S. Educational evaluation procedures. Section (3)(e) of that statute requires the Commissioner of Education to periodically examine and evaluate "the standards by which the school district evaluates basic and special programs for quality, efficiency, and effectiveness."

The term "special programs," as used here, includes vocational programs. In turn, under S.B.E. Rule 6A-1.453: Educational program audits, the Commissioner directs the Division to examine and evaluate vocational programs.

S.B.E. Rule 6A-1.453 provides for periodic audits of both the accounts and programs of each school district. It states in part that the Division shall be responsible for examination of vocational education programs to:

a. Determine compliance with law and criteria established by rules of the State Board;

b. Ensure that individual courses use instructional objectives which are consistent with the criteria for qualification of individual courses as outlined in the publications titled, "Vocational Education Program Courses Standards," Rule 6A-6.571, FAC; and

c. Determine that the capability exists in the instructional setting to accomplish the course objectives.

Under this same rule, the Division also is responsible for: "Examination of adult and community education programs to determine compliance with law and criteria established by rules of the State Board" and "determination of the existence and comprehensiveness of the criteria based on district goals, by which the school district evaluates vocational education and adult general education programs."

The Vocational Education Program Courses Standards (and the new Curriculum Frameworks) provide program descriptions and objectives that may be used as criteria against which the program may be reviewed and evaluated. Basically, program review consists of a self-study by the staff of the program to be reviewed, a visitation and review by a Division staff member, a final report outlining areas of strengths and weaknesses, and a plan for strengthening weaknesses and/or improving the program. The data from the program review instruments are treated statistically and incorporated into the evaluation system.

## Program Advisory Committees

Program advisory committees are mandated by federal (Public Law 90-576) as well as state regulations. A single State Advisory Council is provided for in S.B.E. Rule 6A-6.75: **Advisory Council for Vocational Education.** Committees for individual programs are covered under S.B.E. Rule 6A-6.74: **Duties and responsibilities**, which states that the director of the Division of Vocational, Adult, and Community Education shall "direct the work of the Division to insure the greatest possible coordination, efficiency and effectiveness in vocational and technical education in the state." The Division encourages program advisory committees as a means of fulfilling this mandate.

The Division utilizes a number of advisory committees in addition to those required by law. Each program area—Agribusiness and Natural Resources, Business, Diversified Occupations, Health Occupations, Home Economics, Industrial, Marketing and Distributive, and Public Service Education—has a corresponding state advisory committee. Also, many general advisory committees have been formed to deal with special programs and problems.

Several advisory committees assist school districts and community colleges with vocational program planning and operation. The legal basis for such use of advisory committees may be found in S.B.E. Rules 6A-6.68 and 6A-14.38, both entitled Business and industrial community support. These rules state that school boards and boards of trustees at all levels should take positive steps (which are enumerated) to establish two-way communications and mutual responsiveness between their institution's vocational education program system and the surrounding business and industrial community.

These rules are responsive to the fact that in program development, implementation, and evaluation it is especially important that advisory committees be effectively utilized at the state and local levels. Community resources are an important part of vocational program development.

## OCCUPATIONAL DESCRIPTIONS

This Competency Based Program Guide provides course content information and procedures for secondary, postsecondary vocational schools, and community colleges, conducting programs in the occupational area of **Basic Precision Machining and Precision Machining.**

The Federal Dictionary of Occupational (D.O.T.) Job Titles identifies this occupational area as follows:

| D.O.T. JOB TITLE | D.O.T. CODE |
|---|---|
| Machinist | (600.280-022) |
| Filer | (705.684-018) |
| Grinder | (603.280-018) |
| Buffer | (603.382-010) |
| Lay Out Worker | (600.281-018) |
| Cut Off Saw Operator | (607.682-010) |
| Drill Press Operator | (606.362-010) |
| Lathe Operator | (604.362-010) |
| Mill Operator | (605.685-030) |
| EDM Operator | (609.482-010) |
| CNC Machine Operator | (609.662-010) |

The definition (description) for each of these job titles is abstracted from the D.O.T. for easy reference.

**Machinist (600.280-022)**

Sets up and operates machine tools, and fits and assembles parts to make or repair metal parts, mechanisms, tools, or machines, applying knowledge of mechanics, shop mathematics, metal properties, and layout and machining procedures: Studies specifications, such as blueprint, sketch, damaged part, or description of part to be replaced, to determine dimensions and tolerances of piece to be machined, sequence of operations, and tools, materials, and machines required. Measures, marks, and scribes dimensions and reference points to lay out stock for machining. Sets up and operates metal removing machines, such as lathe, milling machine, shaper, or grinder, to machine parts to specifications. Verifies conformance of workpiece to specifications, using measuring instruments. Positions and secures workpiece in holding device, such as chuck or collet, or on surface plate or worktable with such devices as vises, V-blocks, and angle plates, and uses handtools, such as files, scrapers, and wrenches, to fit and assemble parts to assemblies or mechanisms. Verifies dimensions and alinement with measuring instruments, such as micrometers, height gages, and gage blocks. May operate mechanism or machine, observe operation, or test with inspection equipment, to diagnose malfunction of machine or to test repaired machine. May perform flame cutting and arc or gas welding operations, when required. May develop specifications from general description and draw or sketch product to be made.

**Filer (705.684-018)**

Shapes metal eye castings to fit in wooden shuttles: Files and sand eye castings to specified shape and smoothness, using vise, hand files, and emery cloth. Removes completed castings from vise and places castings in containers. Cleans brass particles from files by drawing file card (block of wood with even rows of metal pins attached) through file grooves.

**Grinder (603.280-018)**

Sets up and operates variety of grinding machines, such as external, internal, and surface grinders, to grind metal workpieces, such as machine parts, dies, or tools, according to knowledge of grinding procedures: Studies blueprint or layout on workpiece to visualize grinding to be done, and plans sequence of operations. Selects grinding wheel, applying knowledge of abrasives and metal properties, and secures it on spindle, using wrench. Dresses wheel with dressing device. Lifts workpiece manually or with hoist, and positions and secures workpiece to holding device, using wrenches and clamps. Selects feed rates, grinding speeds, depth of cuts, and grinding wheel of size, shape, and grade of each operation, applying knowledge of metal properties, abrasives, product specifications, and shop mathematics. Positions and tightens stops to limit travel of workpieces or grinding wheel. Moves controls to position wheel and workpiece in relation to each other, and to set feed, speed, and depth of cut. Starts machine, turns handwheel to feed grinding wheel to workpiece or vice versa, and engages power feeding device. Turns valve handle and directs flow of coolant against wheel and workpiece. Observes operation and adjusts position and action of wheel and workpiece. Verifies dimensions of ground workpieces for conformance to specifications, using measuring instruments, such as templates, micrometers, dial indicators, and gage blocks. Works to tolerances of plus or minus 0.0001 inch. May measure, mark, and scribe workpiece to lay it out for grinding. May dress grinding wheels to complex profiles, using special fixtures and tools. May grind nonmetallic materials, such as plastics. May operate tracer attachment to duplicate contours from templates or models. May be required to have specialized experience with particular materials, product, or precision level, or with machine of particular size, type, or trade name.

Buffer (603.382-010)

Sets up and operates semiautomatic buffing machine to buff parts, such as automobile trim or hardware to specified finish: Reads work order to determine parts to be buffed and setup procedure. Selects holding fixture and bolts it to feed arm. Slides spacers between buffs on spindle to set spacing. Measures and sets angle of feed arm to control position of workpiece against buff, according to specifications or using knowledge of machine operation. Sets length of traverse and stroke of feed arm by adjusting air cylinder and setting stops. Starts buff revolving and clamps workpiece in fixture. Presses button to feed workpiece against buff. Removes buffed part from fixture and examines it to insure that surface coloration meets specifications. Adjusts angle, feed, or traverse of machine to achieve specified finish.

Lay Out Worker (600.281-018)

Lays out metal stock or workpieces, such as castings, plates, or machine parts, to indicate location, dimensions, and tolerances necessary for further processing, such as machining, welding, or assembly, analyzing specifications and computing dimensions according to knowledge of product, subsequent processing, shop mathematics, and layout procedures: Studies blueprint, sketch, model, or other specifications and plans layout. Examines workpiece and verifies such requirements as dimensions and squareness, using rule, square, and straightedge. Lifts and positions workpiece in relation to surface plate manually or with hoist, using such work aids as shims, parallel blocks, and angle plates. Verifies position with measuring instruments, such as gage blocks, height gages, and dial indicators. Determines reference points and computes layout dimensions. Sets indicators on height gage, protractor, or layout machine to computed dimensions, or projects dimensions by setting indicators to specified locations on model and moving instrument or machine so that indicators bear on corresponding locations on workpiece. Indents layout points, using prick punch, center punch, and hammer. Marks or scribes layout lines, using handtools and work aids, such as surface gage, straightedge, compasses, templates, and scriber. Marks such data as dimensions, instructions, and part identification on workpiece. Works to tolerances as close as plus 0.001 inch. May position model in parallel relationship to workpiece. May apply pigment to layout surfaces, using paint brush. May inspect machined parts to verify conformance to specifications. May add dimensional details to blueprints or prepare dimensional drawings to be followed by other workers. May layout sheet metal or plate steel, applying specialized knowledge of sheet metal layout geometry.

### Cut Off Saw Operator (607.682-010)

Sets up and operates metal-sawing machines, such as hacksaw, bandsaw, circular saw, friction saw, and rubber-disk saw to cut metal stock to dimensions: Reads job order for specifications, such as material, type, and size of stock, and dimensions to be cut. Obtains and transfers stock to machine, manually or with hoist. Installs saw blade and sets blade tension and cutting speed for specified operation. Sets saw blade angle to obtain desired angle cuts, using wrench. Sets stops and guides to control dimension of cut, using steel rule and wrenches. Positions and secures stock against stops or in feeding device. Turns valve to start flow of coolant against cutting area. Starts machine and observes operation. Measures work for conformance to specifications, using rule. Marks identifying data on workpiece. Replaces defective cutting blade or wheel, using handtools. May be required to have experience with custom or production work, or with particular material, product, size of workpiece, or type or trade name of machine and be designated accordingly.

### Drill Press Operator (606.362-010)

Sets up and operates numerically-controlled drill press that automatically performs machining operations such as drilling, reaming, countersinking, spot-facing, and tapping of holes in metal workpieces, according to specifications, set instructions, and knowledge of machining: Studies blueprint or setup instructions to determine dimensional specifications, setup requirements, and work procedure. Installs workpiece holders, such as blocks, risers, and clamps on indexing table of machine, using machinist handtools. Lifts workpiece manually or with hoist and positions and secures it on machine table or in holding fixture with clamps and bolts. Installs cutting tools in tool magazine, turret, or spindle of machine. Inserts programmed tape or punched card in tape or card reader of control unit. Actuates machine that automatically positions indexing table containing workpiece under spindle, selects tool, and machines part according to programmed instructions. Stops machine after trial run and inspects machined workpiece to insure conformance to blueprint specifications, using fixed gages, dial indicators, micrometers, and calipers. Monitors machine operation and display panel of control unit for indications of malfunction. Notifies supervisor if machined workpiece does not conform to specifications or if machine malfunctions. May make manual adjustments, such as alining workpiece on machine table, changing cutting tools, or setting cutting speed, feed rates, and depth of cut. May occasionally operate machine in semi-automatic mode by setting selector switch and manually dialing in data according to oral or written instructions to machine relatively simple pieces.

**Lathe Operator (604.362-010)**

Sets up and operates numerically-controlled horizontal lathe to perform machining operations, such as turning, boring, facing, and threading parts, such as castings, forgings, and bar stock: Reads process sheets, blueprints, and sketches of part to determine machining to be done, dimensional specifications, setup, and operating requirements. Inserts beginning point of tape in reading head of control unit. Mounts workpiece between centers, in chuck, or to face plate, manually or using hoist. Selects and installs preset tooling in tool posts, turrets or indexing heads, and automatic-tool-change magazine, in sequence specified on process sheet. Depresses buttons, toggles, or sets tape and starts machining operation. Observes numerical displays on control panel and compares with data on process sheet to verify dimensional adjustments, feed rates, and speeds of machining cuts. Turns dials and switches to override tape control and correct machine performance, applying practical knowledge of lathe operation. Inspects first-run piece and spot-checks succeeding pieces for conformance to specifications, using micrometers and precision dial gages. Studies job packet and organizes materials for next run during automatic tape-controlled cycles to shorten changeover time. May set tools before positioning them in lathe, using precision gages and instruments. May set up and operate another machine tool during tape-controlled machining cycles. May machine nonmetallic materials.

**Mill Operator (605.685-030)**

Tends one or more previously setup milling machines to mill surfaces of metal workpieces to specifications on production basis: Positions and secures workpiece in fixture or feeding device. Starts machine, and turns handwheel to feed workpiece to cutter or vice versa, or engages feeding mechanism. Changes worn cutters, using wrenches. Verifies conformance of work to specifications, using instruments, such as fixed gages, calipers, micrometers, go-not-go gages, and templates. Records production output. May tend machine which mills workpiece according to programmed cycle. May turn controls to adjust feed rate of workpiece or speed of cutting tool. May turn valve handle and direct flow of coolant against cutter and workpiece. May mill nonmetallic materials.

**EDM Operator (609.482-010)**

Operates one or more electrical-discharge machines to shape metal workpieces to specifications, following standard charts: Obtains from job order or verbal instructions such information as electrode to be used, depth setting, and number of workpieces or cavities to be shaped. Mounts specified electrode in preset holder on spindle. Positions and secures workpiece on machine table, or places it in fixture. Moves controls to aline electrode and workpiece, and to set electrode feed rate, depth limit, and electric current. Starts machine, turns on flow of dielectric coolant, and observes operation. May inspect work visually or with measuring instruments.

**CNC Machine Operator (609.662-010)**

Sets up and operates multi-purpose numerically-controlled machine to perform any combination of machining operations, such as milling, drilling, reaming, or broaching metal workpieces to specifications: Reviews set-up sheet and specifications to determine sequence of setup operations and dimensions of finished workpiece. Bolts fixture to machine bed, using wrench. Positions metal stock in fixture according to set instructions, using rule and calipers, and secures workpiece in place, using clamps or bolts. Assembles cutting tools in toolholders and positions tools in machine spindles according to directions, using machinists' handtools, or inserts cutting tools in specified machine magazines. Places control tape or punch card in reader of control console. Turns dials to index cutting tool to specified set point. Turns switches to operating position, and starts machine. Changes cutting tools and location of clamps, and repositions metal stock on fixture as directed by set up instructions. Observes machine operation and verifies accuracy of machined workpiece against blueprints or engineering drawings by measuring cuts with micrometers, dial indicators, and gages. Notifies supervisor of discrepancies. May adjust machine feed and speed and change cutters to machine parts according to specifications when automatic programming is faulty or if machine malfunctions.

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## PROGRAM STANDARDS DESCRIPTION

### Introduction

The Division of Vocational, Adult, and Community Education, Florida State Board of Education, is required by S.B.E. Rule 6A-6.571, to publish VOCATIONAL EDUCATION PROGRAM COURSE STANDARDS annually. The first such standards were published in 1985 and consisted of brief 1-2 page documents called CURRICULUM FRAMEWORKS. These Frameworks contained very brief statements of program objectives and course standards. The Department of Education publishes revisions to Curriculum Frameworks each year; therefore, the latest edition should be obtained annually.

Curriculum Frameworks contain information based on the industry validated competency list. Along with the Curriculum Frameworks are detailed lists of performance objectives called STUDENT PERFORMANCE STANDARDS.

### —Curriculum Frameworks and Student Performance Standards

The Curriculum Framework specifies the course title and course number, applicable level, major course concepts, and intended outcomes. The intended outcomes section is usually based on a competency list, but includes only those performance areas applicable to the course level and purpose. The Student Performance Standards are abstracted from the Competency List, and correspond to the Curriculum Framework. Student Performance Standards list the detailed performance objectives that support the intended outcomes identified in the Curriculum Frameworks. Copies of the July, 1986 published Curriculum Frameworks are provided in Appendix C.

### —Career MAP Competency List

The Career MAP Competency List was developed by an Industry Advisory Committee and serves as the basis for the Career MAP. This Competency List has been validated by the Industry Representatives and reviewed by Educational Representatives noted in the acknowledgements section of this guide. The list relects the entire range of job tasks performed by employees in industry related jobs. It may include more tasks than is normally taught in a vocational program at any one particular school level and will require that instructors and administrators determine which specialty areas and tasks are appropriate for their program.

### —Program Articulation

Vocational programs that teach the same subject at high schools, vocational technical schools, and community colleges should be structured to eliminate unnecessary retraining of students who have mastered competencies at a lower school level. This coordination of programs at different school levels is referred to as ARTICULATION. Specifically, -ARTICULATION- is an arrangement between secondary and vocational-technical centers, and community colleges, which would allow a student who completed a secondary vocational program to enter an area vocational-technical center or community college and receive credit for the secondary vocational program and be placed in the higher level program at an advanced level. It would also allow a student who completed a vocational program in an area vocational-technical center to enter a community college program and receive credit for the area vocational-technical center program and be placed in the higher level program at an advanced level.

An example of ARTICULATION for the Electronics subject area is as follows. A high school student studies the secondary level Electronics program, course code #8730000, CIP #IN47.012500, and becomes competent in the following outcomes on the Curriculum Framework and has satisfactorily performed the applicable items on the Student Performance Standard.

| Framework outcomes | Student Performance Standards |
|---|---|
| 01. Proficiency in Laboratory Practices | 01.001 thru 01.005 |
| 02. Proficiency in DC Circuits | 02.001 thru 02.031 |
| 03. Proficiency in AC Circuits | 03.001 thru 03.031 |
| 04. Proficiency in Solid State Devices | 04.001 thru 04.016<br>(did not complete 04.017 thru 04.020) |

If the student subsequently enrolls in the local vocational technical center Electronics Technology Program, course #EET0001, CIP #IN15.030300, the student should be given credit for previously completing Student Performance Standards 01.001 thru 04.016, and should be placed in the Electronics Technology Program at the student's level of competency, and not required to repeat basic DC, AC, and Solid State subjects already studied in the secondary program. Perhaps some limited review or refresher/reinforcement activity may be necessary in these subjects if a significant time lapse has occurred.

ARTICULATION in this manner will require vocational teachers to interview each student entering a postsecondary level program and determine what competencies have been previously mastered. The teacher may have to utilize the Career MAP, if available, or some type of pre-test or performance evaluation to verify that the student is in fact still competent in the appropriate tasks. Teachers of postsecondary programs will often have two or more course tracks operating simultaneously, one for those students with no prior experience, and one or more individualized or small group tracks for students with various levels of prior experience.

—Career MAP Utilization

I. Career MAP Definition:

A Career Merit Achievement Plan (Career MAP) is a matrix of vocational competencies that is designed for individual students to record the skills they have mastered in school or industry. The MAPs primarily list performance competencies, although some cognitive competencies are included. Career MAPs contain blocks in which each individual task is listed and includes a line for the instructor to sign, indicating that the student has become competent in the performance of the task. Career Maps are published and distributed separately from the Program Guide.

## II. Purpose of Career MAPs:

Career MAPs are being developed for each Industrial Education program in the State of Florida as a means to document student activity and performance and to communicate that activity to employers. The MAPs, showing what a student has already mastered, could also be used by the student when transfering to another school system or a higher level program, to integrate the student into those training programs at the student's level of competence. This is particularly important when entering competency based programs using "open entry-open exit" methodology, or when entering an on-the-job industrial training course. Many companies require employees to periodically attend skill upgrade and crosstraining courses and attend short courses for new equipment and process familiarization. The Career MAP can also be used by employees to record their achievement in industry sponsored training activity, so the MAP becomes an individuals lifetime record of technical competency.

## III. Recommended Utilization of Career MAPs:

A. Teachers in Florida Industrial Education and other Vocational related programs should provide every student they teach, a Career MAP to record the student's mastery of each competency completed in the course. Teachers should ensure that the use of Career MAPs are explained to students and should ensure that the students take their Career MAPs with them when they leave the course.

B. Students should use Career MAPs as a record of their technical competence as they progress from high school courses and/or through vocational technical schools, or through community colleges and on into industrial training programs provided by employers. Students pursuing vocational technical careers should use the Career MAP as an overall record of their entire career achievement, maintaining other individual certificates of course completion as supporting documents for Career MAPs.

## IV. Career MAP Development:

Draft lists of competencies were developed by Industrial Advisory committees under a project administered by the Univerisity of South Florida and funded by the Vocational Division of the State Department of Education. These lists were then reviewed, revised, and validated by craft advisory committees throughout Florida. Committees of teachers as well as industry experts then reviewed the lists. Finally, after Competency Lists were approved by both industry and educational advisors the lists were typeset in a matrix format and printed by the Department of Education. The developers of the MAPs had access to any V-TECS catalogs or Student Performance Standards that were applicable. If objectives were judged relevant they were included but sometimes in different wording. Some competencies listed on the MAP may actually encompass several objectives from other sources or might even be considered as subskills to V-TECS. Career MAPs list competencies that could be learned either in school or after a person has been on the job. Career MAPs, as the words suggest, map the competencies achieved by a person through school training and job experiences.

## V. Career MAP's use with Program Guides and Standards:

Course/Program Standards have traditionally been used in the Program Review process and will continue to be used. The Career MAPs do not replace Course/Program Standards. MAPs usually contain competencies beyond those required at the job-entry level. Future editing of Course/Program Standards will more than likely reflect the wording of many of the competencies in the Career MAPs.

Program Guides will be developed for all vocational programs having validated MAPs. The Guide brings together into one document the critical components necessary to initiate or update an existing program. Included in the Program Guide are the MAP competencies, the Program Standards, and guidelines for curriculum development, use of local craft advisory committees, facilities planning, etc.

Career MAPs are intended to facilitate articulation and communication regarding specific vocational programs. The Career MAP is a baseline document for planning and can be used for a variety of purposes: student counseling; curriculum planning; teacher recruitment, and selection; teacher and program updating; facility layout and design; equipment requirement planning; student evaluation; program improvement; and for discussions with craft advisory committees.

Career MAPs can be used to profile the competencies to be mastered for one or more Dictionary of Occupational Titles (DOT) occupations within the major occupational area. Career MAPs reflect state-of-the-art technology for the occupational area and accommodate competency mastery in an industrial setting through cooperative or internship arrangements. Some advanced competencies included on the MAPs are desirable but not necessary for initial employment and may be learned later as supplemental training. Teachers can acquire class sets of the MAPs and use them daily with students from the first day of instruction, or, after keeping separate records of students' mastery of competencies, teachers can transfer these to the MAP just before students exit from the program. Students can request future employers to authenticate additional competencies as they master them on the job.

## VI. Obtaining Additional MAPs:

Contact the Industrial Education Regional Consultant or the DVE Regional Office to order MAPs. Entire class sets are available for teacher use. Teachers or users outside the targeted population may purchase sets for a nominal cost-recovery fee. For additional information or training in the use of the Career MAPs contact the Regional Consultant or:

Dissemination and Diffusion Section
Division of Vocational Adult
& Community Education
Department of Education
Knott Building
Tallahassee, FL 32301
(904) 488-0405 or Suncom 278-0405

# VALIDATED LIST OF COMPETENCIES
# BASIC PRECISION MACHINING
# and
# PRECISION MACHINING

November 25, 1985

Listed below are competencies that each Basic Precision Machining and Precision Machining Technician should possess to be a productive beginning worker in these occupations. The number to the right of each competency represents the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialized area.

| Number | Specialization |
|---|---|
| 1 | Machinist (600.280-022) |
| 2 | Filer (705.484-010) |
| 3 | Grinder (603.280-018) |
| 4 | Buffer (603.382-010) |
| 5 | Lay Out Worker (600.281-018) |
| 6 | Cut Off Saw Operator (607.682-010) |
| 7 | Drill Press Operator (606.682-014) |
| 8 | Lathe Operator (604.280-010) |
| 9 | Mill Operator (605.685-030) |
| 10 | EDM Operator (609.482-010) |
| 11 | CNC Machine Operator (609.662-010) |

## 01.0 PREREQUISITE MACHINING SKILLS

### 100 Maintaining Immediate Work Area

101 Dispose of scrap metal chips, shavings, trash, & waste (P) 1 2 3 4 5 6 7 8 9 10 11

102 Clean & maintain work areas affected by operations (P) 1 2 3 4 5 6 7 8 9 10 11

| | | |
|---|---|---|
| 103 | Leave area in safe condition (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 104 | Comply with shop safety rules & practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 105 | Comply with shop operating rules & practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 106 | Participate in "clean up" of work & shop areas (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 107 | Maintain a clean & orderly shop (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 200 | Mathematical Calculations | |
| 201 | Make job-related decimal & fraction calculations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 202 | Solve job-related problems by adding, subtracting, multiplying, & dividing numbers (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 203 | Solve job-related problems operating a hand-held calculator (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 204 | Solve job-related problems using basic formulas (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 205 | Solve job-related problems using basic geometry (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 206 | Solve job-related problems using basic trigonometry (P) | 1 3 5 9 |
| 207 | Solve job-related problems using mathematical handbooks, charts, & tables (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 208 | Measure work piece & compare measurements with blueprint specifications (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 209 | Calculate amount of material that should be removed to obtain correct limits for secondary operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 210 | Convert measurements from English to metric & from metric to English (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 211 | Determine clearance, relief, & rake of cutting tool (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 212 | Calculate machine speed & feed by using appropriate formulas (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 300 | Blueprint Reading & Machine Planning | |
| 301 | Interpret view concepts (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 302 | Read lines (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 303 | Apply principles of dimensioning (P) | 1 3 5 9 |
| * 304 | Apply principles of tolerance expressions (P) | 1 3 5 9 |
| 305 | Read & interpret title blocks (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 306 | Read & interpret change orders on working & assembly prints (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 307 | Read & interpret abbreviations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 308 | Make shop sketches (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 309 | Read & interpret blueprints to include geometric tolerancing (P) | 1 2 3 4 5 6 7 8 9 10 11 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 310 | Determine & interpret reference information used in performing machine work (C) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 311 | Perform layout for precision machine work by using layout instruments (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 312 | Lay out radii & bolt hole circles (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 313 | Inspect, remove, & replace manufactured parts that need repair or machine work (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 314 | Select the most productive tool & tooling for a given operation (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

400 Measuring Operations

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 401 | Read & measure with rules & calipers (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 402 | Read & measure with micrometers (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 403 | Read & measure with vernier tools (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 404 | Read & measure with dial indicators (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 405 | Measure with surface plate (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| * 406 | Read & measure with gauge blocks & adjustable gauges (P) | 1 | | 3 | | 5 | | | | 9 | | |
| * 407 | Measure with sine bars (P) | 1 | | 3 | | 5 | | | | 9 | | |
| * 408 | Take readings with a hardness tester (P) | 1 | | | | 5 | | | | | | |
| * 409 | Take readings with an optical comparator (P) | 1 | | | | 5 | | | | | | |
| * 410 | Inspect the finished product (P) | 1 | | 3 | | 5 | | | | 9 | | |

500 Maintenance On Machines & Tools

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501 | Lubricate equipment parts (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 502 | Clean & store hand tools, cutters, fixtures, jigs, & attachments (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 503 | Inspect & repair hand tools (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 504 | Inspect drive pulley or belt (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 505 | Select lubricants for machining operations (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 506 | Inspect equipment for safe operational conditions (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 507 | Store grinding wheels (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 508 | Store precision tools (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 509 | Inspect & adjust machine guards (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 510 | Inspect work area for safe working environment (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

## 02.0 BENCH WORK SKILLS

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | Cut materials by using hand hacksaws (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 002 | Cut threads by using hand taps (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 003 | Cut threads by using die (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 004 | Ream holes by using hand reamers (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 005 | Hand sharpen cutting tools by using abrasive stone (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 006 | Hone & lap surfaces (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 007 | Remove damaged screws & other hardware (P) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

| | | |
|---|---|---|
| 008 | Set up & use arbor-press broaches (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 009 | Deburr work piece (P) | 1 2 3 4 5 6 7 8 9 10 11 |

## 03.0 POWER SAW OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Remove & replace saw blades (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Select the appropriate blade to perform a given sawing operation (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | Select & set speed & feed for a sawing operation (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Measure material & cut off material by using power saw (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Saw to scribed lines by using a metal band saw (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Cut & weld band-saw blades to be inserted for contour sawing (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 007 | Set up & operate a saw for angular cutting (P) | 1 2 3 4 5 6 7 8 9 10 11 |

## 04.0 PEDESTAL GRINDER OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Comply with safe & efficient practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Identify the parts of the machine & explain their use (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | Set up a support rest (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Dress grinding wheels (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Grind lathe tools to the required angles (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Sharpen drills (P) | 1 2 3 4 5 6 7 8 9 10 11 |

## 05.0 DRILL PRESS OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Identify the parts of the machine & explain their use (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Identify & set the machine controls (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | Comply with safe & efficient work practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Select the proper tooling (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Set up & operate for hole work, center drill, drill, ream, counter-sink, counterbore, & power tapping (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Set a drill press for the proper feed & speed for specified operation (P) | 1 2 3 4 5 6 7 8 9 10 11 |

## 06.0 LATHE OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Identify the parts of the machine & explain their use (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Comply with general safe & efficient work practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |

| | | |
|---|---|---|
| 003 | Measure stock (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Set up an engine lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Secure a tool, tool-holder, & fixture or attachment (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Select & set feeds & speeds (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 007 | Set up a lathe & face the work piece held in a chuck (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 008 | Rough-cut & finish-cut with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 009 | Perform lathe filing to deburr a part (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 010 | Align lathe centers using accurate methods (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 011 | Drill a hole with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 012 | Countersink a hole with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 013 | Ream a hole with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 014 | Tap threads with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 015 | Die-cut threads with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 016 | Counterbore a hole with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 017 | Bore a hole with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 018 | Knurl a part with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 019 | Cut external threads with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 020 | Rechase threads with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 021 | Cut internal threads with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 022 | Set up & perform taper turning with a taper attachment (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 023 | Set up & perform taper turning with the compound (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 024 | Cut an internal tapered surface (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 025 | Set up & operate a tool-post grinder (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 026 | Perform contour, angular, or radii cuts with a lathe (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 027 | Set up & use a follow- & a steady-rest (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 028 | Set up face plates & dogs (P) | 1 2 3 4 5 6 7 8 9 10 11 |

## 07.0 MILLING MACHINE OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Identify the parts of the horizontal & vertical machine & explain their use (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Comply with safe & efficient work practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | True up the head & align a milling machine fixture (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Select & set the feed & speed for milling work (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Square up a work piece with a table vise (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Perform end milling (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 007 | Perform fly-cutting operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 008 | Drill holes with a milling machine (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 009 | Perform reaming operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 010 | Cut an external keyway (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 011 | Bore a hole with a milling machine (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 012 | Perform form milling (P) | 1 2 3 4 5 6 7 8 9 10 11 |

| | | |
|---|---|---|
| 013 | Perform indexing operations using a dividing head (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 014 | Set up & operate a rotary table (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 015 | Mill cylindrical work (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 016 | Mill an external radius (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 017 | Mill an angle (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 018 | Align a milling machine attachment (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 019 | Mill an internal slot with a slotter & attachment (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 020 | Perform cutting-off operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 021 | Perform straddle milling operations on the horizontal mill (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 022 | Set up & perform slab mill operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 023 | Use an edge finder & wiggler (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 024 | Use digital readouts (P) | 1 2 3 4 5 6 7 8 9 10 11 |

### 08.0 GRINDING MACHINE OPERATING SKILLS

| | | |
|---|---|---|
| 001 | Identify the parts of the machine & explain their use (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Comply with safe & efficient work practices (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | Select the proper wheel for a given operation (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Inspect, balance, dress, & true, a grinding wheel (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 005 | Select & set the feed & speed of a power-feed grinder (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Attach & align a work piece for grinding operations (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 007 | Cut off or part a work piece with a grinding machine (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 008 | Set up & grind parallel flat surfaces (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 009 | Set up & grind four sides square (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 010 | Set up a grinder to run a work piece between centers (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 011 | Measure, inspect, & rework a work piece on a grinding machine (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 012 | Set up, grind, & sharpen preshaped lathe tools (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 013 | Set up & use a radius dresser (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 014 | Set up & use angle plates (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| * 015 | Operate a cyclindrical grinder (P) | 1 3 |
| * 016 | Grind to a shoulder (P) | 1 3 |
| * 017 | Grind a taper (P) | 1 3 |
| * 018 | Set up & operate an I/O grinder (optional) (P) | 1 3 |

| | | | | | |
|---|---|---|---|---|---|
| 09.0 | TOOL & CUTTER OPERATING SKILLS | | | | |
| * 001 | Identify the parts of the machine & explain their use (C) | 1 | 9 | | |
| * 002 | Identify & select proper machine controls (P) | 1 | 9 | | |
| * 003 | Comply with safe & efficient work practices (P) | 1 | 9 | | |
| * 004 | Select proper work holding devices (P) | 1 | 9 | | |
| * 005 | Perform truing, dressing, & forming operations to blueprint specifications (P) | 1 | 9 | | |
| * 006 | Compute proper speeds (P) | 1 | 9 | | |
| * 007 | Sharpen an endmill (P) | 1 | 9 | | |
| * 008 | Sharpen a horizontal milling cutter (P) | 1 | 9 | | |
| 10.0 | COMPUTERIZED NUMERICAL CONTROLS & OPERATING SKILLS | | | | |
| * 001 | Identify the parts of the machine & explain their use (C) | 1 | | | 11 |
| * 002 | Identify & select proper machine controls (P) | 1 | | | 11 |
| * 003 | Comply with safe & efficient work practices (P) | 1 | | | 11 |
| * 004 | Write a basic program & apply basic programming skills (P) | 1 | | | 11 |
| * 005 | Select the proper work holding devices (P) | 1 | | | 11 |
| * 006 | Select the proper cutting tools (P) | 1 | | | 11 |
| * 007 | Machine a part to blueprint tolerances (P) | 1 | | | 11 |
| 11.0 | EDM MACHINE OPERATING SKILLS | | | | |
| * 001 | Identify the parts of the machine & explain their use (C) | 1 | | 10 | |
| * 002 | Identify & select proper machine controls (P) | 1 | | 10 | |
| * 003 | Comply with safe & efficient work practices (P) | 1 | | 10 | |
| * 004 | Select proper work holding devices (P) | 1 | | 10 | |
| * 005 | Select & use proper power-supply settings (P) | 1 | | 10 | |
| * 006 | Select & use the proper electrode material & dielectric fluid (P) | 1 | | 10 | |
| * 007 | Calculate proper electrode size for the operation to be performed (P) | 1 | | 10 | |

## 12.0 HEAT-TREAT FURNACE OPERATING SKILLS

| | | |
|---|---|---|
| * 001 | Identify the parts of the machine & explain their use (C) | 1 |
| * 002 | Identify & select proper machine controls (P) | 1 |
| * 003 | Comply with safe & efficient work practices (P) | 1 |
| * 004 | Select & identify proper heat treatment processes (P) | 1 |
| * 005 | Perform a basic heat treatment process to blueprint specifications (P) | 1 |

## 13.0 EMPLOYABILITY SKILLS

| | | |
|---|---|---|
| 001 | Conduct a job search (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 002 | Secure information about a job (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 003 | Identify documents that may be required when applying for a job (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 004 | Complete a job application form correctly (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 005 | Demonstrate competence in job interview techniques (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 006 | Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 007 | Identify acceptable work habits (C) | 1 2 3 4 5 6 7 8 9 10 11 |
| 008 | Demonstrate knowledge of how to make job changes appropriately (P) | 1 2 3 4 5 6 7 8 9 10 11 |
| 009 | Demonstrate acceptable employee health habits (P) | 1 2 3 4 5 6 7 8 9 10 11 |

### KEY

| | |
|---|---|
| (C) | Cognitive |
| (P) | Performance |
| * | These competencies are included in the list for the Precision Machining program ONLY. |

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# INSTRUCTIONAL APPROACH

Local decisions must be made by school administrators & teachers concerning the appropriate methods to use to deliver instruction & measure student achievement. In many instances, a mix of various instructional approaches may be deemed appropriate to present instruction in a comprehensive and efficient manner. It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. The teacher must lead the students through the learning experiences in a course. This leadership role requires the teacher to motivate students to aggressively pursue learning activities. The teacher must select the methods of instruction that best apply to the students ability levels and that allow the teacher to control the learning processes, to measure student achievement, and to provide feedback to the student.

## Key Factors to Consider

### —Student Characteristics

Adolescent - Immature students need constant control, a high degree of motivational leadership, and relatively simple learning activities.

Adult - Mature students are more often self-motivated, need less control, and can accept complex learning activities.

Prerequisites - Can the student read, write, calculate mathmatics, and understand English language at the ability level required to complete learning activities.

### —Teacher Characteristics

Subject Knowledge - The teacher must be a subject matter expert—must be able to teach instructional concepts and evaluate student performance. Should have significant amount of experience actually working in industry/vocational area.

Instructional Delivery - The teacher must motivate and lead the student as well as know how to organize and present various types of instruction. Innovative instructional methods should not be attempted if the instructor is not qualified to use them.

Instructional Development - Teachers must select materials, and often develop their own materials, to be used by students. The materials used must support the methods of delivery. The teacher must be qualified to select and develop course materials, or else use instructional packages developed by other qualified sources.

Instructional Measurement - Teachers must select testing methods that support the instructional delivery system used. Teachers must be qualified to develop, administer, and evaluate both written and performance type tests.

—Instructional Setting Characteristics

Time Constraints - Traditional methods of instruction in school systems are controlled by the time periods available. Instruction must be made to fit the time available for training unless the time constraints are removed. If time constraints are not a factor, innovative methods of instruction may be appropriate such as:

- open-entry/open-exit
- self-paced/independent study
- computer based instruction
- competency based instruction

Facilities and Equipment - Instructional methods selected must take into consideration the space available, the number of work stations for students and the amount of tools and equipment available for student use.

## Conventional Instructional Methods:

Any given course of instruction may require some instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve skill competency. If mastery of a task is required, competency-based education methods may be more appropriate. If the training activity envolves an orientation or a seldom perfomed nonessential task, conventional instructional methods are acceptable.

## Competency-Based Vocational Education Instructional Methods:

The focus of Competency-Based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified in an objective statement. Competency-based instruction can be included in conventional instructional settings as well as innovative settings. CBVE does not require self-paced/individualized methods of instructional delivery to be used as the only means for CBVE instruction.

## CBVE PRINCIPLES AND CHARACTERISTICS

1. The curriculum is based on well defined, job related tasks or competencies. The curriculum should be designed to have students do things, not just read resources, or view AV materials.

2. Each period or unit of instruction contains a performance objective, stated in terms of observable, measurable activities.

3. Teachers provide students with a list of the performance objectives, the standards to be met and other performance criteria.

4. Teachers may utilize any appropriate method of instruction to present the subject matter to students. Teachers can mix various methods together in any given program, or course, or unit of instruction, to achieve the most efficient means for the students to learn the subject matter and competently perform the task as specified in the objective. Possible methods of instruction used in CBVE programs may include:

   —Group paced lectures and demonstrations.

   —Instructor controlled practice activities.

   —Self-paced instruction for individual learning activities and repeated practice.

   —Small group or team teaching methods where several students work together on a piece of equipment or a project, or activity.

5. Teachers must have a method of recording each student's achievement for each performance objective. This can be in the form of a record book, or a progress chart, a check off sheet, or a series of well planned performance tests.

6. Teachers must inform each student that they have either met the criteria specified for each performance objective or they have not adequately performed the task. The student must be informed of any inadequate performance and provided the opportunity and resources to practice performing the task until adequate performance is attained. This is probably the most difficult aspect of managing CBVE instruction, for it requires the teacher to individually coach or tutor a student for a controlled period of time, requiring the student to practice performing the task several times, and ultimately making the decision that the student is either competent at the task or not competent. The teacher may limit the time allowed for repeated task practice.

7. Student performance is evaluated in comparison to the standards and performance criteria stated in the objective, not to the performances of other students. If performance meets the

standard, the student passes the objective 100%. If the student does not meet all the criteria specified, the student is not 100% competent in performance of the task and should not be given credit for completing the task. The student can be given an incomplete grade if continued attempts will be made to pass the objective.

8. Teachers may use both performance tests and written tests to determine competency. Written tests can be used to measure knowledge of performance procedures, equipment identification, math and science abilities, etc. Performance tests can be used for actual student performance of a task, to a prescribed standard, under specified conditions.

### CBVE GOALS

The goal of Competency-Based Vocational Education is to have all students reach the specified standard of competency. Instructional methods, quantity of instruction, and performance evaluation methods will vary according to the instructional situation. CBVE instruction allows for the use of a multitude of instructional resources and procedures, including individual self-paced units of instruction to allow the student to master the objective. This approach differs from traditional instruction in which all students use the same materials and spend the same amount of time in a course where student achievement is expected to vary—not the instructional approach.

## Teacher and Student Roles in CBVE

The requirements of competency-based vocational education have major implications for the roles that teachers and students perform and for the kinds of skills that teachers need. In competency-based settings, teachers must not only be dispensers of information; but they must also become managers of a variety of instructional resources that they select and use to tailor instruction to the needs of individual learners. Teachers spend less time providing content information and much more time helping individuals master objectives. In a competency-based setting, the teacher may present some group instruction as well as develop alternative resources, and function as a tutor and a counselor, a diagnostician of learner needs, a prescriber of instructional experience, and an evaluator of competent performance.

The teacher in this setting has, then, a more complex, varied, and rewarding role than ever before. Teachers need to be able to design their course or programs around measurable, job-related skills and to ensure that these skills are, indeed, necessary for obtaining and keeping a job. They must be able to state objectives clearly and in a way that permits objective measurement. Teachers must be able to carry out this measurement in a way that accurately assesses student achievement and that exactly reflects what the competency really involves.

Teachers must also be able to adapt their instruction to individual learning needs so that each student can acquire the competencies (s)he needs. This ability to tailor instruction demands knowledge of a wide variety of individualization strategies, as well as skill in applying these strategies systematically.

A major assumption underlying CBVE is that students who are actively involved in carrying out their programs of study will learn more and retain more than students who passively accept information fed to them. Thus, an important part of the teacher's job is to encourage students to assume more and more responsibility for their own learning.

Because students are doing many different kinds of things, and because the teacher must coordinate the activities of all the students in a course, the individual student's role inevitably involves more responsibility than it does in traditional settings.

Many of the basic management tasks that teachers formerly undertook by themselves-tasks such as record keeping, monitoring student progress, and monitoring the use of resources-must become the joint responsibility of teachers and students in a competency-based setting.

Some teachers worry that giving students more responsibility will result in a loss of teacher control. On the contrary, however, most teachers find that they have more control in a competency-based setting than in a traditional, group-oriented setting. The teacher has, after all, designed the system or environment in which students must operate; without the teacher there to manage the overall system, it would soon cease to function.

## Instructional Concepts:

Instruction should be systematic and reflect program goals. A list of competencies and specific performance objectives with criterion-referenced measures should be used.

1. **Program Plan**

   The training program should progress in logical steps and provide for alternate sequences, where applicable.

2. **Student training plan**

   A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet each goal. Every student should be given a copy of his/her training plan.

3. **Preparation Time**

   Adequate time should be provided for teacher preparation and program development and/or modification.

4. **Teaching Load**

   The instructor/student ratio and class contact hours should allow time for interaction on a small-group and a one-to-one basis.

5. **Curriculum**

   a. The specific competencies in the Career MAP Competency List should be included in each area of program-specific instruction. Additional competencies may be added to meet the needs of local employers. All additional competencies should be approved by the program advisory committee.

   b. Instructions on the legal aspects and responsibilities in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts or supplies, and basic record-keeping should be a part of the training program.

6. **Student Progress**

   A record of each student's progress should be maintained through use of the Career MAP or another type of Progress Chart. The record should indicate the competencies required for mastery and those competencies the student has mastered.

7. **Performance Standards**

   Instruction should be performance based, with an acceptable performace standard stated for each task. These standards should be shared with students and potential employers. Students should demonstrate "hands on competency" or "mastery" of a competency before the instructor verifies the student's performance.

8. **Safety Standards**

   Safety instruction must be given prior to shop work and be an integral part of the training program. A safety test must be included in the training program. Eye protection must be worn in any shop/lab area, when required.

9. **Personal Characteristics**

   All training activities and instructional material should emphasize the importance of maintaining high personal characteristics. Employability skills training and evaluation should be integrated throughout the training program.

10. **Provisions for Individual Difference**

The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accomodated.

11. **Related Instruction**

Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

12. **Testing**

Both written and performance-based tests must be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

## COURSE OUTLINE/SAMPLE LESSON PLAN

Units of instruction used by Vocational Education teachers must be correlated to the Curriculum Frameworks, and Student Performance Standards. The Curriculum Framework provides the basis for developing the course outline. Each school should utilize the resources and modules that apply to the scope of their program and the various methods of instruction their situation dictates.

Teachers may develop their individual course outlines using the resources and instructional material contained in the last section of this guide. They may also develop their own units of instruction as they feel may be necessary to meet the intended outcomes stipulated in the Curriculum Framework. The number and order of presentation of the modules can be varied to fit the objectives of the course.

For example, a school may elect to go into depth in only a few of the modules, or it may decide to cover a wider range of modules but in less depth. This program can be offered for a single semester or for two or more semesters, depending upon the local situation. A student should not be given credit for enrolling in the same component of instruction more than one time.

### Sample Course Outline

Vocational teachers should prepare a comprehensive outline of subjects to study for each course they teach. Each student should be provided a copy of the course outline. Teachers may use any format they desire for the outline, and should include the following information on the course outline.

### Recommended Course Outline Contents

1. Course name.
2. Course number (state directory number and/or local number).
3. Course start date or individual start date.
4. Identification of time periods for study if applicable.
5. Identification of place or room/facility for study or practical work.
6. Identification of teacher/instructor/assistants responsible for instruction and/or evaluation.
7. Identification of units or subjects to study (objectives) or competencies, etc., including Task # or Duty #.

8. Identification of primary resources or references available to study.

9. Identification of major practical exercise work, projects, or activities to perform.

10. Identification of major tests or examinations to be administered.

## SAMPLE COURSE OUTLINE FORMAT

Course Name ____________________________

Course Number ____________________________

Course Dates ____________________________

| Instruction unit or period | Duty or Task # Module | Subject/ Objective/ | location | Instructor | Reference |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

## Lesson Plans/Teachers Guides & Student Guides

Teachers should prepare lesson plans or teachers guides & student guides for subjects on the course outline. Lesson plans are appropriate for traditional periods of instruction whereas teachers guides may be more appropriate for other types of instructional activities. Student learning guides may be used for traditional periods of instruction but they become a necessity for self-paced learning activities. Teachers guides contain all instructional information as well as tests & answer keys, whereas student learning guides contain only student information.

A sample student learning guide is provided in the following pages. This sample is an example of the material a teacher would provide students with for self-study in a competency-based course activity. Each page of the sample contains a different topic for the sake of illustration only. An actual student learning guide would be written around only one objective.

SCHOOL NAME & LOGO

| | | |
|---|---|---|
| A | Industrial Education | A STUDENT LEARNING GUIDE |
| B | TASK: | Write Letters Of Application |
| C | DUTY: | Applying For A Job |
| D | PURPOSE: | |

A letter of application is your introduction to a potential employer. The purpose of this letter is to get an interview and a job. A prospective employee who can prepare effective application letters is one step ahead of the competition.

| | Dept. | Prog. | Duty | Task | Prereq. |
|---|---|---|---|---|---|
| E | BU | * | JA | 02 | JA-01 |

Each learning guide has a cover page like the sample above that contains the following items:

A. the name of the program

B. the task-a statement of exactly what you will be able to do or know when you complete the learning guide.

C. the duty-the broad unit in which this task is found.

D. the purpose-a statement of why it is important to attain the task.

E. identifying information such as department, program, duty, task, and prerequisite. The prequisite in the box on the far right tells you that you must have already attained the task identified there before proceeding to attain the one in the present learning guide.

**STUDENT PERFORMANCE OBJECTIVES:**

A **TERMINAL PERFORMANCE OBJECTIVE:**

B **GIVEN:** plans and a residential site.

C **YOU WILL:** construct and set forms for a continuous footing.

D **HOW WELL:** You must successfully complete the Written Test and score 100% on the Performance Test.

**ENABLING OBJECTIVES:**

1. Identify styles, uses and parts of forms.
2. Prepare for constructing continuous footings.
3. At a school work station, construct and set forms for a continuous footing.

E

| Dept. | Prog. | Duty | Task |
|---|---|---|---|
| IN | 9163 | F | 01 |

The student performance objective page, similar to the sample you see above, contains the following information:

A. the terminal performance objective (TPO)-the broad heading that encompasses the three items beneath it and states in detail what will be expected of you at the end of the learning guide

B. the given-a statement of what will be provided when you take the written or performance test

C. the you will-a statement of what will be required to attain the task

D. the how well-a statement of the degree of performance excellency required to attain the task

E. the enabling objectives (EO's)-the steps to be taken in attaining the task

A ENABLING OBJECTIVE NO. 2

B Disassemble fuel injector and inspect parts.

C

| LEARNING STEPS | RESOURCES |
|---|---|
| 1. Disassemble injector. | 1. a. Needle valve injector<br>b. Mechanic' tool set<br>c. Injector tools |
| 2. When completed, evaluate your work using the Self-check. | 2. Self-Check enclosed |
| 3. Have instructor evaluate your recordings. | 3. Instructor |
| 4. Go on to Enabling Objective No.3. | |

E

| Dept. | Prog. | Duty | Task | EN.OBJ. |
|---|---|---|---|---|
| IN | 9123 | C | 05 | 2 |

The enabling objectives are the heart of the learning guide. They provide detailed steps of what to do and when to do it.

There is an enabling objective page for each EO listed on the student performance objective page. The EO page resembles the sample above, and contains the following information:

A. the number of the EO being learned

B. a restatement of the EO as it appeared in the student performance objective

C. the learning steps-they tell you what to do

D. the resources-they tell you what items you will need to complete the steps

INSTRUCTION SHEET

### Mounting Tires

Follow the procedure below for mounting a tire on a rim. Pay close attention to all safety precautions.

CAUTION: WEAR SAFETY GLASSES AT ALL TIMES!

1. Visually inspect tire for any wear or damage.
2. Place the rim on the changer with the narrowest flange up — hand tighten centering cone.
3. Lubricate bead of tire with soap solution.
4. Place tire in position on the rim with as much bead over the rim flange as possible. This provides a starting position for bead lifting tool.
5. Attach the air hose for inflating the tire.

CAUTION: KEEP THE HANDS AND BODY AWAY FROM TIRE WHILE INFLATING. IF THE TIRE SHOULD EXPLODE YOU COULD BE INJURED!

| Dept. | Prog. | Duty | Task | En Obj |
|---|---|---|---|---|
| IN | 9043 | B | 02 | 2 |

The procedure in using the EO page is to follow each learning step in sequence. The first several learning steps will tell you to read or view particular resources identified to the right of the step (see #2 on the sample EO page). Other learning steps will ask you to practice or apply the knowledge or skill (see #3 on the sample).

Another learning step will identify the type of feedback used in evaluating the skill or knowledge called for in the EO. Often this is a self-check (see #4 on the sample). Some learning guides will have instruction sheets on the order of the above sample.

SELF-CHECK

DIRECTIONS

Evaluate your work using the items listed below. All items should receive a "yes" response.

| | YES | NO |
|---|---|---|
| 1. Was the stocked area layed out with a pencil and chalk line?...................... | ___ | ___ |
| 2. Did each end of the stock area begin with a stack of blocks?........................ | ___ | ___ |
| 3. Was the line hung on the left lead first?... | ___ | ___ |
| 4. Was the line hung in 45 seconds?............ | ___ | ___ |

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

| Dept. | Prog. | Duty | Task | En Obj. |
|---|---|---|---|---|
| IN | 9133 | B | 18 | 2 |

The self-check gives you immediate feedback on how well your learning is progressing.

WRITTEN TEST FOR TASK NO. ____

**TASK:** Demonstrate and use Ohm's Law

## Directions

The purpose of this test is to determine if you fully understand how to demonstrate and use Ohm's Law. To successfully complete this test, all items must be answered correctly.

The items below are Multiple Choice. On the separate answer sheet, put the letter of the correct answer in the blank to the left of the number of the question.

## Multiple Choice Question

____ 1. According to accepted theory, electric current is:
- a. the electron at rest.
- b. the flow of electrons.
- c. the movement of atoms.
- d. the movement of protons.

____ 2. The ohm is the unit of electrical:
- a. current.
- b. voltage.
- c. pressure.
- d. resistance.

| Dept. | Prog. | Duty | Task |
|---|---|---|---|
| IN | 9273 | B | 02 |

PERFORMANCE TEST FOR TASK NO.____

| | |
|---|---|
| TASK: | Perform Cash Transactions |

STUDENT'S NAME ______________________ DATE ______________

**DIRECTIONS TO STUDENT:** In a store situation, you will set up a till and place the currency in the proper place. You will be evaluated for attainment of this task, based upon the items listed below.

| ITEM NO. | ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" Response. | YES | NO | |
|---|---|---|---|---|
| 1. | Were all bills placed in the proper slot?........ | ... | .. | ..... |
| 2. | Were all coins placed in the proper compartment?. | ... | .. | ..... |
| 3. | Was the work area cleaned?...................... | ... | .. | ..... |

______Score

____Attained

____Not Attained

| Dept. | Prog. | Duty | Task | Attempt |
|---|---|---|---|---|
| DE | 4623 | C | 03 | |

______________________________

EVALUATOR'S SIGNATURE

The performance test is always the last page of the learning guide. It may identify checkpoints of evaluation in the performance of skill, or it may list desirable characteristics of the finished product.

**Example of Student Learning Guides taken from : Learning at Ridge Vocational Technical Centers, State of Florida, Department of Education, Division of Vocational Education; June, 1980.

## STUDENT ORGANIZATION PARTICIPATION

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The Florida State Board of Education (S.B.E.) Rules authorize vocational student organizations as an integral part of the vocational education program S.B.E. 6A-6.64 (7) and 6A06.65 (8).

Vocational Student Organizations are operated throughout the Nation on the basis of legal endorsement, financial support, and active participation of federal, state and local levels of government as well as the civic and business communities.

Vocational Student Organization Activities are an integral part of the vocational curriculum in Florida. The organizations are designed to expand and enrich opportunities for leadership development, social awareness, civic responsibility, and vocational understanding.

Students who participate in the activities of a vocational student organization are better prepared to take their places in the world of work. They acquire firsthand knowledge of the many opportunities available in their chosen careers, and become aware of the value of their contributions to society.

Vocational student organizations provide opportunities for members to participate in activities which relate to actual or anticipated employment. Students develop and utilize their talents and abilities in ways that otherwise could not be available to them.

### Vocational Industrial Clubs of America (VICA)

The Vocational Industrial Clubs of America (VICA) is an organization for students enrolled in trade, industrial, technical, and health occupations in high schools, area vocational-technical centers, and junior and community colleges.

VICA promotes high standards in work ethics, craftmanship, scholarship, and saftey while it fosters a deep respect for the dignity of work. In addition, the precepts of VICA help students relate school experiences to their search for meaning, identity, and achievement. A great deal of emphasis is placed on the functions of labor and management organizations, their interdependence, and their importance.

VICA members learn and develop skills in many different trades, including building, automotive, mechanical, heavy equipment, and electrical.

In addition, students in such personal service occupations as cosmetology may be a part of VICA.

Prestige and recognition are offered to the VICA member through a local, regional, state, national, and international program of competition and awards. Opportunities to develop personal leadership skills are provided through workshops and seminars while competitive activities help to develop the students' perspectives.

Membership in VICA helps students learn to work together and prepare for life through a continuing emphasis on the importance of each person's role as a contributing member of American society.

**What is VICA?**

VICA is an organization for students enrolled in fulltime secondary or post-secondary trade, industrial, or technical occupations education programs. It is the only national (and international) organization for trade and industrial students.

VICA gives every member a chance to learn, to enjoy the interaction with other students, to assist their schools and communities, and to grow and mature in qualities necessary to meet the challenges of the life ahead of them. VICA members are no different from other students except that they have found a way to make their formal training and education an enjoyable and rewarding experience. They're "turned on" to the satisfaction, rewards, and fun they have found in VICA.

VICA is the students' organization; the goals, purposes, and activities that relate to their own personal career goals and life interests. VICA is for students with a definite future in mind—people who can think with their minds and work with their hands, people who are proud of their work they do and want to learn to do it better. VICA is for those who want to develop as members of society, to learn to express themselves, to work with others, and to make contributions as individuals.

VICA is YOUR organization.

VICA is much more than contests.

VICA is training youth for leadership roles within their schools and communities.

VICA is instilling in youth the importance of participation, within their school, within their community and within the student organization.

VICA is also participation in leadership and skill areas.

A good VICA program gives Industrial Education programs high visibility.

Contests at the local-club level determine which students shall represent their school in regional competitions. Instructors should plan and conduct contests within their trade areas. This philosophy shall also prevail for leadership areas of emphasis. (Successful competitors at local school levels may, in school districts so desiring, compete within the district. THIS IS A SCHOOL DISTRICT OPTION.)

Successful competitors at the local school level compete at one of Florida's five regional contests. Successful competitors next compete at the state level. The state winners compete on the national level, in the United States Skill Olympics.

Competitors for the International Skill Olympics (ISO) are determined by a combination of leadership and skill abilities. The International Skill Olympics Committee establishes all rules and guidelines for the ISO.

The following additional criteria will be used in the selection of International contestants:

a. Overall citizenship—as demonstrated by attitude toward school, occupation, VICA, additional training, etc.

b. Evaluation of progress in skills and knowledge of trade, metric applications, print reading, and layout of problem.

c. Personal desire to represent VICA and the United States in international competition.

d. Willingness to make a commitment to VICA as to purpose of organization, code of conduct, preparation time, etc.

e. Contestant's self-reliance, basic intelligence, ability to follow instruction, maintain schedules, and adapt to last-minute changes.

## Local VICA Organization

1. School Club

   Each school is one club (with one charter). A "school" shall be defined as one that appears with an assigned number in the current Florida Directory.

2. Chapters

   In the event that a school has a multiple sessions, each session shall be identified as a "chapter" (examples: morning session identified as chapter #1, afternoon session chapter #2, evening session chapter #3, etc.).

3. **Section**

Each occupational program within each chapter shall be identified as a "section" (examples: auto mechanics, welding, cosmetology, etc.).

## Organizational Structure

Conducting a local club activity is the responsibility of every member. Every member must have a function to perform. A balanced organizational structure is necessary to equalize the workload as well as to pinpoint responsibility. When the students know what is expected of them, they can better use their abilities to plan and execute their own activities and, at the same time, grow in leadership ability. An effective organizational structure allows for the mixing of people and personalities, which is good human relations training.

It is a good idea to make a poster-size (or larger) organizational chart, to display it on the bulletin board, and to duplicate smaller copies of the chart so each member may have a copy. Members are less likely to shirk their responsibilities when all members are aware of everyone's assigned duties. Advisors must be careful to enforce the chain of command in all decisionmaking situations.

The national organizational structure shows the relationships of the local, state, and national organizations. It is important that every member understand just how the total organization functions. See VICA Organizational Diagrams at Appendix B.

## Integrating VICA and Instruction

What is meant by the phrase "Integrating VICA and Instruction?" Some teachers feel that integrating VICA activities in between their instructional activities (in printing class, slotting VICA between a unit on the offset press and a unit on stripping) is best. Then there is always the teacher who says,"Look, nothing really happens Friday afternoons anyway, so I will slot VICA activities in on Friday afternoon. We will have our 5-minute VICA club meeting and that will satisfy the talk about integration of VICA activities into the instructional program."

This is not what we are talking about. We are talking about VICA being an integral part of everything that happens inside the classroom.

You may wish to secure and study the slide-tape program "Integrating VICA and Instruction" that is available from your Regional Program Consultant or Regional Program Advisor. You also may wish to purchase the set.

In-school instruction involves the organized presentation and application of knowledge, skills, and attitudes. Laboratory occupational experiences require the individual student to apply, in a simulated work setting, the knowledge, skills, and attitudes acquired through in-school instruction. VICA activities are part of in-school instruction and laboratory occupational experiences. Integrated club activities improve and tie together the existing curriculum.

VICA is specifically for Vocational Instruction Education. The activities of a chapter can be part of the learning experiences planned for any vocational class. Vocational education classes such as welding, foods, drafting, and auto mechanics can utilize VICA as a teaching tool. Any student who is enrolled in Vocational Industrial Education and meets membership requirements can be a member of a VICA club.

Job skills and procedures are often well defined and structured in the vocational programs. For example: in individual vocational courses, such skills as drawing to scale in drafting, tuning a motor in automobile mechanics, and keeping production records in a vocational printing course are taught. Although such skills are often taught at all levels in vocational education, the attitudes and values that promote employability and employment stability often are neglected parts of structured skill-oriented vocational programs. For example: learning experiences dealing with such activities as getting along with coworkers, accepting constructive criticism, or taking orders might not be as easily dealt with or integrated into skill-oriented, vocational courses. (See chart below.)

### CLUB ACTIVITIES PROVIDE EXPERIENCE
### THAT LEAD TO EMPLOYABLE
### SKILLS AND ATTITUDES

1. Getting along with co-workers.
2. Respecting authority.
3. Accepting criticism.
4. Respecting the rights dignity of others.
5. Meeting deadlines.
6. Working with supervisors.
7. Taking directions.
8. Communicating clearly.
9. Taking initiative.
10. Being punctual.
11. Assuming responsibility.
12. ____________________
13. ____________________
14. ____________________

### Being an Effective Advisor

The effective advisor believes in student-directed learning, is organized, and is flexible in planning. The effective advisor works to become a respected person in the community, thereby building support for VICA activities. The effective advisor blends the classroom world with the "working" world and associations, and involves students with business, professional, and community leaders. The effective advisor promotes enthusiasm. For these efforts, the effective advisor receives a lifetime of psychological rewards.

The following club/classroom activities from the teacher/advisor viewpoint, should make being an advisor easier.

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1. Advise and guide; do not dictate.
2. Positively assume that club activities are going to succeed. Know that club activities are strong teaching tools. Show enthusiasm.
3. Establish basic ground rules that help students to lead themselves. Hold meetings regularly and conduct meetings in a business-like manner.
4. Organize activities. Set up club files and a library of club-related materials.
5. Remember that club activities are individual and group activities and are NOT teacher activities.
6. Use students as class leaders.
7. Develop professional slide presentations about club work in classes.
8. Develop an informational packet to use with the community and other school personnel. Include such things as curriculum outlines, training plans, national headquarter promotions, calendars of work, etc.

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## Necessary Groundwork—Selling the VICA CLUB

Selling club activities to the department chairman, school administrators, and the community is an important first step in the organization of a club. You may be told that there can be no clubs in the classroom and that few students join any more. Keep in mind that the VICA organization is not a club in the traditional sense. With ingenuity, a club can work in any situation in spite of rigid rules. Stress that VICA is INTEGRAL TO THE TOTAL PROGRAM AND SHOULD BE CONSIDERED A VERY IMPORTANT TEACHING TOOL IN AND OUT OF THE CLASSROOM/SHOP. Some suggestions on how to sell club-work are included below.

1. Discuss ideas. Don't spring the idea of an integrated club on people whose support will be needed.
2. Inform people about the state and national organizations by handing out and discussing promotional materials.
3. Make starting a VICA organization part of the agenda of the Craft Advisory Committee's meeting. Present your proposals to this group. Let the committee work with students to plan a program of activities.
4. Survey students on their interests in club activities. Compile and distribute results.
5. Check course outlines to see how club activities can fit in. Add these activities to lesson plans.
6. Relate the school philosophy to the national VICA Organization's goals, purposes, and program of activities.
7. Project the number of resource persons that students would contact in the community who would be up-to-date experts in certain areas.
8. Identify the club as an important public relations tool.
9. Show how club activities are important motivational projects that promote student-directed learning.
10. If necessary, point out the benefits of club activities in relation to the relatively low cost-per-student.
11. Confer regularly with those in charge, i.e., department chairpersons, officers, and school administrators.

## STUDENT ADMISSIONS CRITERIA

### Introduction

Leading the individual student to successful completion of a vocational education program—in either a secondary or a post-secondary institution—should be the only major concern of a school's teaching effort. It is, therefore, of the utmost importance to direct thought, planning, and effort into identifying and selecting students with excellent potential for success in the educational program and in the industry. The school's primary task is to prepare people for full-time, entry-level positions as technicians or, in the case of those with more experience, as managers. Recruiting efforts will, of course, vary from school to school depending upon level (secondary or post-secondary), courses available, and local needs.

Students enrolled in an occupational cluster should be able to benefit from the instructional content therein with reasonable expectations for employment upon successful program completion.

In accordance with the Course Code Directory, an occupational program is offered to students at grade levels specified therein. The specific student admissions criteria required by the state and local education agencies are identified below.

### Specific Admissions Criteria

| | SECONDARY | POST-SECONDARY |
|---|---|---|
| Minimum age: | n/a | n/a |
| High School Diploma or GED Required: | no | yes |
| Physical Requirements: | none | none |
| Special Requirements: | none | none |
| * Minimum Basic Skills Math Level: | n/a | 7.0 |
| * Minimum Basic Skills Language Level: | n/a | 7.0 |

*This grade level number is specified in the Curriculum Framework and is derived from a state basic skills examination.

In addition, attention should be focused on other personal qualities that, in theory, may be subject to improvement within a training program but, in reality, may prove to be serious impediments to success. Typical would be deficiencies in communications and mathematical skills. Such skills should be measured by tests and the results used as a screening guide or as a basis for providing additional program requirements.

## The Student Profile

It is difficult to find an "ideal" student. Many will apply for a place in various training programs. The question is: How can students with the most potential for success be selected?

To attempt to draw a profile of the ideal student candidate would be fruitless because the ideal candidate cannot be defined in a manner that would fit all localities, nor even in such a way as to fit all situations in a single locality. Nevertheless, it is appropriate for the Craft Advisory Committee and the school system to develop a profile as a basic guide, with the certain knowledge that supplying candidates at any given time will necessarily entail compromise.

Rejecting high school students requesting admission to a vocational program would probably not be permitted in any school system in the nation. Even if students could be screened, it would be difficult to determine which would be successful. In a high school program, it may be best to accept as many students as possible and let their abilities surface in the first year or two. It may then be possible to place the strongest students in a vocational "capstone" course in their senior year, either for employment upon graduation or as a necessary prelude to admission to a post-secondary program. Obviously, this is not a perfect solution; but in the real world, perfection is rare.

The community college should make a greater effort to enroll the "ideal" student. This may be done through a process of screening "all comers" or by consciously recruiting potential students with known qualifications. In either case, the school and the Craft Advisory Committee will need to draw a profile of the desirable student. The profile will contain a list of qualities, traits, and aptitudes that combine to make a potentially successful candidate. Since few of these qualities are completely missing in any one person, acceptable levels must also be determined. The qualities deserving of highest attention—mechanical aptitude, for example, or native intelligence—are those which the educational program itself is unlikely to be able to change. Accordingly, such matters should carry considerable weight in establishing the basic profile. Other matters—deficiencies in mathematical or communications skills, for example—may lend themselves to improvement through related instruction, even though they are not parts of the training program per se. Following is a list of specific qualities the Advisory Committee and school staff should consider when establishing the student profile:

## MECHANIC/TECHNICIAN—SERVICE

- —Knowledge of basic tools and equipment used by mechanics/technicians
- —Aptitude needed to think through and solve mechanical and technical problems;
- —Ability to understand written mechanical/technical materials;
- —Ability to interpret mechanical/technical drawings;
- —Mechanical dexterity.

## MECHANIC/TECHNICAL SERVICE MANAGEMENT

- —Basic knowledge of service;
- —Business skills;
- —Ability to work with people;
- —Communications skills;
- —Leadership.

## Qualifying and Pretesting

The process of qualifying a potential student for training must be an integral part of the recruiting process. Considerable amounts of time and money will be spent on students entering training. There must be some assurance that they are receptive to, and capable of benefitting from, the training that will be provided.

In the normal process of recruitment, recruiters will have some idea of the candidate's basic traits and capabilities. Whoever guides the candidate to the program will also have some knowledge of the person's interests, abilities, and experience. These perceptions should be considered by school admissions officials.

Care must be taken, however, to assure that highly favorable early-interview impressions—or negative impressions, for that matter—do not prejudice the final decision. Determination of the candidate's potential for success can be greatly aided by pre-school testing. Such tests can yield reliable clues to certain characteristics, such as mechanical aptitude, that are essential. The tests can also tell a great deal about the candidate's present knowledge and skills. These, in turn, can help determine how much and what kind of training each individual should receive.

Despite the efficacy of many tests, a caveat should be noted. Standardized testing has come under fire, in recent years, from many quarters. It has frequently been charged, for example, that some standardized tests are culturally biased and, consequently, favor one group in society over another. Those charged with responsibility for admissions should be aware that testing, while it can often provide valuable insights, should never be the sole criterion for admissions.

## Counseling and Guidance

Counseling is a two-fold activity. Its first use is to guide the qualified, prospective student into the program; its second is to help the enrolled student on a continuing basis throughout the program.

Entry into a program does not cause all student problems to vanish; each student will encounter new problems as the program unfolds. The counselor's job is to work with the student to help identify problems and then work toward their solution. The counselor must also constantly watch for signs of discouragement or loss of interest and attempt to determine their causes.

Much day-to-day counseling will necessarily fall to the teacher. The teacher has the most contact with the student and is often in a position to detect and correct a problem while it is small. Overlap of responsibility between teacher and counselor should be apparent. The importance of working together in this critical area cannot be overstated.

The professional counselor cannot be expected to have the expertise of the teacher. The teacher will therefore provide much of the counseling that focuses on trade knowledge and skills. The counselor, on the other hand, will focus on the student's needs for advice on related instruction and in connection with personal growth, interests, and attitudes. In large programs, at least one counselor with deeper knowledge of the industry should be available.

## Student Placement

Placement will not be a factor with some students, such as those currently employed in the industry. A student from industry, even if in school by personal choice, is likely to have a good idea of where to go when the program is completed. The school placement program should, of course, be as available to these students as to anyone else.

The placement program, for the most part, will serve students who enter with little or no experience in, or contact with, the industry. Many such students will develop industry contacts during the course of instruction, particularly if a cooperative program is offered.

It is logical to center placement activity at the school. The school has an organized placement office for other occupations.

The task of the placement official is to fit graduating students to job openings in the community. Identifying graduating students is a simple task, but the placement official will also need to know something of each student's personal aims and interests in addition to what is on the achievement record. The placement official should develop a form that will provide this information in simple format for easy reference. The placement official, the counselor, and the teacher should assist students in the preparation of effective resumes.

Input concerning employment openings is somewhat more difficult to organize. Such input must come from individual service establishments in the community. Each job listing should include as much detail as possible about the work involved. A standard form for this purpose will facilitate matching an applicant to a job.

The placement official should attempt to expose a given student to as many suitable job openings as possible. Conversely, employers should be exposed to as many qualified candidates as possible. The placement official should take special pains to avoid matching up an applicant and a job that are obviously not suited to each other.

The final fit of placing technicians in an appropriate job is the joint responsibility of the student and the employer. The success of this final decision will be greatly enhanced when both student and employer have numerous interview opportunities and as wide an area of choice as possible.

The role of the Craft Advisory committee in placement is two-fold:

—To work closely with the school in establishing an adequate placement function and to evaluate its performance on a continuing basis;

—To work closely with all industry establishments in the community to encourage them to use the school's placement office; to provide adequate job information to the placement office; and to develop an effective procedure for interviewing and evaluating potential employees suggested by the school.

If the need for competent technicians is as great as claimed, and if the educational program performs in such a way as to produce qualified technicians, the failure of local service establishments to follow through with job listings and effective interviewing and hiring practices can seriously impair the ultimate success of the program. It is up to the Advisory Committee to make certain that student placement proceeds in a smooth and effective manner.

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## TEACHER CERTIFICATION AND QUALIFICATIONS

### Qualifications

The Teacher is qualified to teach by one of the following methods:

1. Regular or temporary Florida teacher's certificate with appropriate coverage;
2. Approval of local school board consistent with adopted school policy; or
3. Regular or temporary Florida teacher's certificate with other than appropriate coverage; has met all occupational experience requirements prescribed as a prerequisite to appropriate certification, and has been approved by the school board to teach out-of-field.

Refer to the Curriculum Framework for this program to determine the certification coverage for this program.

### Instructional Staff

It is recommended that the instructional staff have technical competency and meet all state and local requirements for certification.

1. Technical Competency

   Instructor(s) sould have demonstrated technical competency and should hold current, nationally recognized certification in the laboratory areas taught. Instructors should hold current, nationally recognized certification, if awarded.

2. Instructional Certification

   Instructors should meet all state certifying requirements.

3. Technical Updating

   Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructor(s) to return to industry on a regular basis for in-service and skill upgrading.

4. Safety and First Aid

   One or more instructor(s) in each department should hold a current American National Red Cross Standard First Aid Certificate.

## 5. Substitutes

A systematic method of obtaining "substitute" or "supply" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instuctor in the occupational area and specific competencies taught.

## FACILITY DESIGN CRITERIA

### Introduction

Even the best instructor should not be expected to turn out competent and immediately productive graduates if they are forced to learn with out-of-date, improper, or inadequate facilities, tools, and equipment. Planning for and providing the proper facilities, tools, and equipment are difficult parts of establishing a training program, especially when space and budgetary constraints are considered. Facilities, tools, and equipment should be adequate to meet teaching objectives.

This section of the Program Guide contains guidance for setting up classroom activities as well as lab or shop facilities. Diagrams of typical classroom and shop layouts are contained in Appendix A.

### Real-Life Facilities

The training facility cannot duplicate the real-life facility in which the student will work after graduation. However, the more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies, and test equipment should conform to local industry usage. Although different facilities may utilize different makes of tools and equipment, the actual differences in operation of most equipment are usually not so great. The on-the-job training each graduate will inevitably receive will usually reconcile differences between equipment used in the school and that in the commercial shop.

### Teaching Facilities

Additional facilities and equipment will be required that are peculiar to the teaching job itself. Among the more important are:

Classroom space;

Audio-Visual Equipment—motion picture, slide, filmstrip, and overhead projectors; videotape units; microfiche readers;

Special devices to demonstrate basic principles and theory;

Duplication of tools and appropriate equipment to enable several students to work individually on the same service operation;

"Live Work" area(s) or laboratory facilities.

A superior instructor could no doubt make do without much of this equipment. But the availability of state-of-the-art training devices enhances the effectiveness and efficiency of any classroom.

Efficiency means achieving instructional objectives in the shortest time possible. By reducing training time and lost motion, the "return on investment" of the facility increases, competent maintenance persons enter the industry more quickly, and the individual student initiates a career and begins producing personal income sooner.

### Updating Facilities

Facilities and equipment need updating just as curriculum, course content, and instructor capability do—and for the same reasons: technological change and improvements from year to year. Updating facilities and equipment may be more costly than updating course content—but failure to do so, at least minimally, will almost certainly impair the effectiveness of the program in a relatively short time.

### Detailed Facilities Analysis

The advisory committee can assist the school in establishing priorities for installing facilities, tools, and equipment. Some are necessary; others are advantageous; and some can be considered nice to have, but essentially unnecessary. Careful planning and analysis of needs over several years can, however, lead to the establishment of a first-rate facility in almost any community.

### Facilities Organization

In planning adequate facilities, one of the more critical considerations—and one that is far too often underestimated—is providing adequate space to meet the changing needs of the instructional program. Buildings should be designed and constructed for future expansion.

### Work Station Arrangement

The arrangement of work stations and specialized equipment depends upon the general shape of the facilities, the number of specialized areas depends, to some extent upon the preferences of staff. However, a few fundamentals should be kept in mind:

Convenient location of entrances and exits;

Easy access to and among service benches;

## Traffic Flow

The overall layout of the service facility should be planned so that the location of entrances and exists permits a logical flow of work in progress. The arrangement of benches to obtain an efficient traffic pattern is one of the most critical factors in planning a facility.

## Personal Tool/Equipment Storage Area

A student tool storage room or area should be provided, with adequate shelf space for tool boxes and floor space for equipment. This area should afford maximum security for student tools.

## Additional Facility Considerations

1. Training Stations

   Training stations and live work areas must be available in the type and number required for the performance of the tasks outlined in the program goals and performance objectives.

2. Safety

   The facilities must meet all applicable safety standards.

3. Maintenance

   A regular facilities maintenance program should be used to assure facilities are suitable when required for instruction.

4. Housekeeping

   The classroom, laboratory, and support area(s) should be kept clean and orderly.

5. Office Space

   An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

6. Instructional Area

   A classroom convenient to, but separate from, the laboratory area should be available for instruction and other non-shop activities.

7. Storage

   Storage areas for tools, parts, supplies, and machines must be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

8. **Support Facilities**

Restrooms, clean up areas, and lockers should be provided convenient to the instructional area.

9. **Ventilation**

If required, an adequate fume removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

10. **First Aid**

A first aid station must be in place, well marked, and complete with appropriate supplies.

11. **Facility Evaluation**

The advisory committee should be asked to conduct an annual evaluation of the facilities to assure adequacy to meet program needs.

## SUGGESTED EQUIPMENT AND SUPPLIES

## PRECISION MACHINING

### Equipment

Equipment and tools used in this program must be of the type and quality found in industry and must also be the type needed to provide training to meet the program goals and performance objectives.

1. **Safety**

   Equipment and tools used in the training program must have all shields, guards, and other safety devices in place and operable.

2. **Type and Quality**

   The tools and equipment used in the training program must reflect the program goals and performance objectives. Sufficient tools and equipment must be available on site for the training offered. The tools and equipment must meet industry quality standards.

3. **Consumable Supplies**

   Sufficient consumable supplies should be readily available to assure continuous instruction. Consumable supplies such as solvent, sand paper, etc., are not contained in the equipment list.

4. **Maintenance**

   A preventive maintenance schedule should be used to minimize equipment down-time.

5. **Replacement**

   A systematic schedule for replacement should be used to maintain up-to-date tools and equipment at industry and safety standards. Student follow-up and advisory committee input should be used in this system.

6. **Inventory**

   An inventory system should be used to account for tools, equipment, parts, and supplies.

7. **Parts Purchasing**

A systematic parts purchasing system from work order to supplier should be used. Task performance should not be unreasonably delayed due to a lack of replacement or component parts.

8. **Hand Tools**

Each student should have a basic hand tool set comparable to tools required for employment. The student should be encouraged to purchase a hand tool set during the period of instruction.

9. **Storage**

Adequate storage of tools should be provided. The space needed depends upon whether hand tools are provided for students by the school. If students are required to purchase their own hand tools, space will still be required to store special tools and test equipment.

The following equipment list is based on an assumed class size of 20 students. The first part of the list contains items needed for classroom activities. The second part of the list contains the tools and equipment required to perform the tasks associated with each category of the Competency/Framework/Student Performance Standard/ lists.

## SUGGESTED EQUIPMENT LIST

## PRECISION MACHINING

NOTE: All items listed are recommended for both Secondary and Post Secondary Programs, unless noted by an * (Optional)

### CLASSROOM EQUIPMENT

(20 students)

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Blackboard | |
| 1 | Bulletin board | |
| 5 | Bookcases | |
| 5 | Cabinet-storage, fireproof/nonfireproof | |
| 20 | Chairs | * |
| 20 | Desks (optional if shop workbenches are used for classes) | * |
| 10 | Individual study areas w/AV capability (as required) | * |
| 1 | Projector, film 16mm | * |
| 1 | Projector (overhead/35mm) | * |
| 1 | Projector screen | * |
| 10 | Steel shelves | |
| 1 | VCR - Television - Video camera | * |

## SHOP TOOLS & EQUIPMENT

These tools and items of equipment are normally used in a Precision Machining shop having work stations for 20 students.

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

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01.0 Perform prerequisite machining skills.

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The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| | (Quantity of 5 per item is based on 5 work stations per 20 students.) | |
| 5 | Micrometers, English & Metric | |
| 5 | Height Gages | |
| 5 | Gage Blocks | * |
| 5 | Vernier Protractor | |
| 5 | Vernier Caliper | |
| 5 | Sine Bars | |
| 5 | Dial Indicators | |
| 5 | Height Micrometer | * |
| 5 | Optical Comparator | * |
| 5 | Electronic Height Gage | * |
| 5 | Box, Tool, Large | |
| 20 | Steel Measuring Rule, 12" | |
| 20 | Pocket calculator | * |
| 5 | Tester, Metal Hardness | * |
| 20 | Bench, Maple, or Steel, 30 in. x 60 in. | |
| 20 | Stool, bench | |

| | | |
|---|---|---|
| 5 | Divider & Caliper Set | |
| 5 | "C" Clamp Set | |

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**CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD**

## 02.0 Perform bench work skills.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Abrasive Wheel Cut-Off Saw | |
| 1 | Air Compressor | |
| 3 | Bench Grinders | |
| 1 | 50 Ton Press | |
| 5 | Layout Tables | |
| 1 | Standard Buffer, bench | |
| 5 | Hammer, chipping | |
| 1 | Vacuum, Shop | |
| 5 | Adjustable Wrench Set | |
| 1 | Pipe Wrench Set | |
| 1 | Tool Board | |
| 5 | Screwdriver Set | |
| 5 | Punch & Chisel Set | |
| 5 | File Set | |

| | |
|---|---|
| 5 | Letter & No. Stamp Set |
| 5 | Drill Bit Set |
| 5 | Reamer Set |
| 5 | Allen Wrench Set (Bracket) |
| 5 | Hacksaw, frame only |
| 5 | Screwplate Set, 1/4" - 1" |
| 5 | Screw Extractor Set |
| 20 | Vise, Machinists, 5" |
| 5 | Locking Plier Set |
| 5 | Hose, Air Recoil, 25 ft. |
| 1 | Riveter, Pop |
| 5 | Hose, Air, 10' |
| 1 | General Mechanics Tool Set |
| 5 | Vise Grip Pliers |
| 1 | Press, Arbor |
| 1 | Anvil, Blacksmiths 140 lb. |
| 1 | Rod Cutter |
| 5 | Thread Tap Sets |
| 20 | Safety Glasses |
| 1 | First Aid Kit |
| 5 | Tape Measures |
| 5 | Scratch Awl |

CATEGORY NUMBER & TITLE -- COMPETENCY / STUDENT PERFORMANCE STANDARD

03.0 Set up and operate power saws.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Welder, Spot Portable | * |
| 1 | Welding goggles | * |
| 1 | Bandsaw, Vertical 20 in. | |
| 1 | Bandsaw, Horizontal | |
| 1 | Metal Saw, Saber | |
| 1 | Metal Saw, Reciprocal | * |
| 1 | Abrasive Wheel Cut-off Saw | * |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

04.0 Set up and operate pedestal grinders.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 2 | Grinder, Pedestal, 1 in. x 8 in. | |
| 3 | Grinder, Pedestal, 3/4 in. x 6 in. | |
| 5 | Grinder Wheel Set | |

.CCATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

05.0 Set up and operate drill presses.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 2 | Drillpress, 20 in., Bench | |
| 2 | Drillpress, 15 in., Bench | |
| 1 | Drillpress, Floor | |
| 1 | Drill Point Grinder | |
| 5 | Vise, Drill Press | |
| 1 | Radial Arm Drill | |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

06.0 Set up and operate lathes.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 2 | 9" Bench Lathes | |
| 1 | 15" Lathe w/digital readout | |
| 1 | Surface Plate Set | |
| 1 | Drill, Letter A-Z | |
| 5 | Dividing Head, 11 in. | |
| 5 | Drill, C-bores & End Mill Tool Set | |
| 5 | Head, Boring | |
| 1 | Lathe, with hex Turret | |
| 2 | Lathe, 15 in., Engine | |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

07.0 Set up and operate milling machines.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Edge Finder & Wiggler Tool Set | |
| 5 | Mill Cutters, Rotary Set | |
| 5 | Milling Machine Drill Sets | |
| 3 | Milling Machine, Vertical, with Digital Readout | |
| 2 | Milling Machine, Horizontal, with Digital Readout | |
| 1 | Table, Rotary 12 in. | |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

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08.0 Set up and operate grinding machines.

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The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Grinder, Cylindrical | * |
| 5 | Grinder, Surface, Automatic | |
| 1 | Grinder, Surface, Hand | |
| 5 | Grinder, Tool & Cutter Set | |
| 5 | Grinder, Tool Post | |
| 5 | Grinding Wheel Dresser | |
| 1 | I/O Grinder | * |
| 1 | Radius Dresser | * |

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CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

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09.0 Set up and operate tool machines and cutters.

---

Selected items from previously listed categories are required to perform specific tasks in this category.

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

10.0 Apply computerized numerical control operations skills.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Single spindle Automatic CNC machine | * |
| 1 | CNC Machine Tool Set | * |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

11.0 Set up and operate EDM machines.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Electrical Discharge Machine | * |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

12.0 Set up and operate heat treat furnaces.

The tools and equipment listed below are required to perform the tasks associated with the competency statements contained in this category. Selected items from previously listed categories may be required to perform specific tasks.

| QUANTITY | DESCRIPTION | REMARKS |
|---|---|---|
| 1 | Furnace, Heat Treating | * |

CATEGORY NUMBER & TITLE — COMPETENCY / STUDENT PERFORMANCE STANDARD

13.0 Demonstrate employability skills.

** No special equipment necessary.

## SAFETY

The Florida State Board of Education establishes rules for the operation of public schools. Part III, Section B, Chapter 6A-2 of the State Board of Education Rules (S.B.E.) contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage, and illumination.

Specifically, subsection 6A-2.97, which follows, contains regulations unique to Vocational classes.

S.B.E. Rule 6A-2.97: Safety devices in shops, laboratories, and other process areas, states:

(1) Use of personal protection devices and other protective equipment is required when students and staff are exposed to the following:

  (a) arc welding, heavy gas cutting, scarfing;

  (b) spot welding, brazing, or cutting;

  (c) machining of any materials causing flying chips;

  (d) injurious radiations, dusts, fumes, gases, vapor mists;

  (e) sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body; [or]

  (f) chemicals, acids, caustics, and molten metals

(2) Personal protection devices which come in contact with the skin shall be sanitized after each use.

(3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.

(4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

(5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.

(6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.

(7) Welding operations shall be located in a shielded area, and the area shall be free of combustible material and persons not wearing protective devices.

(8) Areas where toxic fumes are produced shall be properly vented to the outside.

(9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof motor-driven equipment with filters in place.

(10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.

(11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one or more conspicuously color-coded disconnect switches at convenient locations throughout the space.

(12) Kilns shall be properly shielded from combustibles, combustible surfaces, and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.

(13) Automotive, body, and frame repair areas requiring welding and cutting shall be separated from engine overhaul and related fuel handling activities.

(14) A tire cage shall be provided when pressurizing tires on split rims.

(15) Vehicle lifts shall be provided with a mechanical safety lock.

(16) Piping and working machinery with component parts shall be safety color-coded in accordance with ANSI Z53.1-1971.

(17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.

(18) Hazardous work and storage areas shall be identified by appropriate caution signs.

(19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.

(20) Safety zone lines shall be used on the floor area surrounding working machinery.

(21) Fume hoods shall be provided and kept in proper operating condition. Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in the fume hoods.

(22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided, properly installed, and maintained correctly.

## PRINTED AND AUDIOVISUAL MATERIALS

### Learning Resources

Support material consistent with both program goals and performance objectives should be available to staff and students.

1. **Service Manuals**

   Manuals with current manufacturer's service procedures and specifications. These manuals must be located where students can use them while working in the shop area.

2. **Multi-Media**

   Appropriate up-to-date multi-media materials such as flip charts, tape slides, motion pictures, overhead transparencies and video projection media should be decentralized, readily available wherever possible, and utilized in the training process.

3. **Instructional Development Services**

   The services of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication of printed material and overhead projector transparency development. Instructional development personnel should conduct in-service workshops and/or other training in curriculum and media development on a structured basis.

4. **Periodicals**

   Current general and technical magazines and newspapers should be available for student and instructor use.

5. **Student Materials**

   Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Where textbooks are used, specialized texts should carry a copyright date no older than 3 years, basic texts no older than 6 years.

## Printed and Audiovisual Materials

This list contains an extensive number of organizations providing training materials. Some materials are free; for others, there is a charge. Details should be requested in writing prior to ordering.

## Textbooks

1. Machine Tool Technology; (textbook and study guide) McKnight Publishing Company.
2. Florida State Department of Education, Vocational Division. Teaching Academically Disadvantaged Students in Vocational Education Courses, #DD012 BK-82.
3. Florida State Department of Education, Vocational Division. Keys to Managing Competency-Based Instruction, #TE036 BK-77.
4. Florida State Department of Education, Vocational Division. Guidelines For The Review and Selection of Instructional Materials for Competency-Based Education, #TE034 BK-80.
5. Florida State Department of Education, Vocational Division. Employability Skills Series, #CE001 SS-81. (CE003, CE004, CE009, CE010, CE017, CE018, CE024, CE025, CE029, CE030, CE037, CE038)

## Audiovisuals

1. KIT 621.91; Bergwall, New York.

   "1- Vertical Milling Machine Explained"
   1 Basic Parts
   2 Setting Up
   3 Accessories & Work Samples
   4 Rotary Table
   5 Additional Accessories
   6 Digital Readout System

2. KIT 671.3; Aims Media, Glendale, California.

   "1- Sheet Metal Machine"
   1 Introducing Box & Pan Brake
   2 Making a Box
   3 Combinating Beading Machine
   4 Forming Roll Operations

3. KIT 614.83; 2000 Company, Newport Beach, California.
   "Introduction to Machine/Metal Shop Safety"

4. FL 621.942; Orlando, Florida.
   "The Turret Lathe"

5. (No library number) "EDM Operation"; Hansvedt, Urbana, Illinois.
   Chapter 1 What is E.D.M.
   2 E.D.M. Spark
   3 E.D.M. Process
   4 E.D.M. Equipment
   5 E.D.M. Controls
   6 Job on the E.D.M.
   7 E.D.M. Electrode
   8 E.D.M. Estimating
   9 Troubleshooting the E.D.M. Job
   10 E.D.M. Review

6. FS 621.94; ACI Films.

   "Drill Press Series"
   1 Drilling a Hole in Flat Stock
   2 Countersinking & Counterboring
   3 Starting a Tap
   4 Special Uses of the Drill Press

7. DUK 621.942; Bergwall, New York.

   "The Lathe Explained"
   1 Its Basic Parts
   2 Setting Up Work
   3 Its Accessories
   4 Work Operations on 3 & 4 Jaw Chucks
   5 Three Ways to Cut a Taper
   6 Cutting a Thread

8. KIT 621.942; Doubleday Metromedia.

   "The Metalworking Lathe"
   1 Boring
   2 Cutting an External Thread
   3 Drilling and Reaming
   4 Lathe Turning Between Centers
   5 Lathe Turning, 3 & 4 Chuck
   6 Speeds, Feeds, & Knurling

9. KIT 681-C.2; Coronet Media, Chicago, Illinois.

   "Shop Measuring Instruments"
   1 Steel Rule and Related Instruments
   2 Calipers and Dividers
   3 Micrometers
   4 Verniers
   5 Dial Indicators
   6 Gage Blocks

10. DUK 621.994; Bergwall, New York.

"Measuring Tools Explained"
1 The Vernier Caliper
2 The Outside Micrometer
3 The Inside Micrometer
4 Depth Gages
5 Dial Indicators
6 Protractors and "JO" Blocks

11. DUK 621.91; Bergwall, New York.

"The Milling Machine Explained"
1 Its Basic Parts
2 Setting Up
3 Accessories and Work Samples
4 The Universal Milling Attachment
5 The Dividing Head
6 Work on the Dividing Head

12. NTMA101 "Single Point Cutting Tools"; National Tool & Machining Association, Washington, D.C.

13. NTMA102 "Twist Drill"; National Tool & Machining Association, Washington, D.C.

14. NTMA103 "Milling Cutters"; National Tool & Machining Association, Washington, D.C.

15. NTMA104 "Thread Cutting"; National Tool & Machining Association, Washington, D.C.

16. NTMA105 "Secondary Cutting Operations"; National Tool & Machining Association, Washington, D.C.

17. NTMA201 "Basic Inspection Instuments"; National Tool & Machining Association, Washington, D.C.

18. NTMA202 "Mathematics for Machinists"; National Tool & Machining Association, Washington, D.C.

## PROFESSIONAL ORGANIZATIONS AND SUPPORT SERVICES

### Professional Organizations

Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional, and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

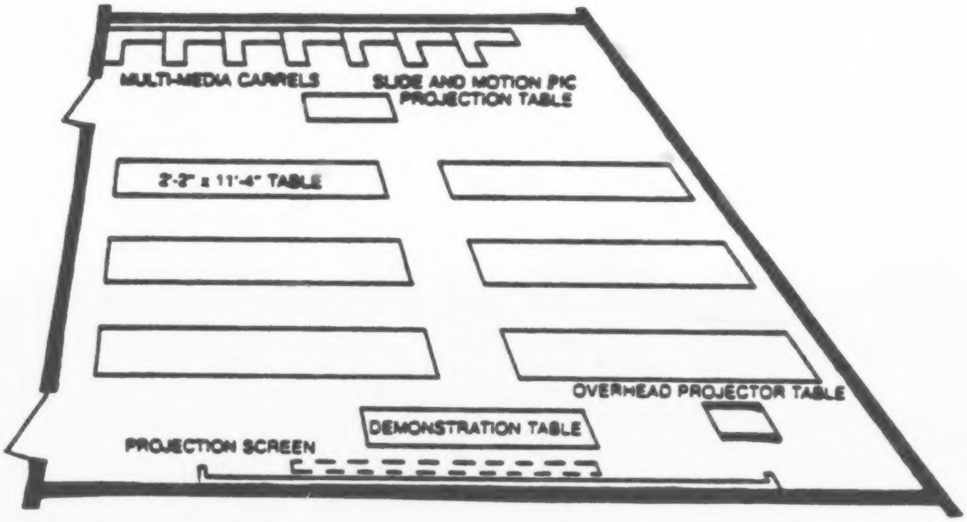
NATIONAL TOOL AND MACHINING ASSOCIATION

SOCIETY OF MANUFACTURING ENGINEERS
Southwest Florida Chapter No. 283
6092 Red Maple Road
Bradenton, FL 33507

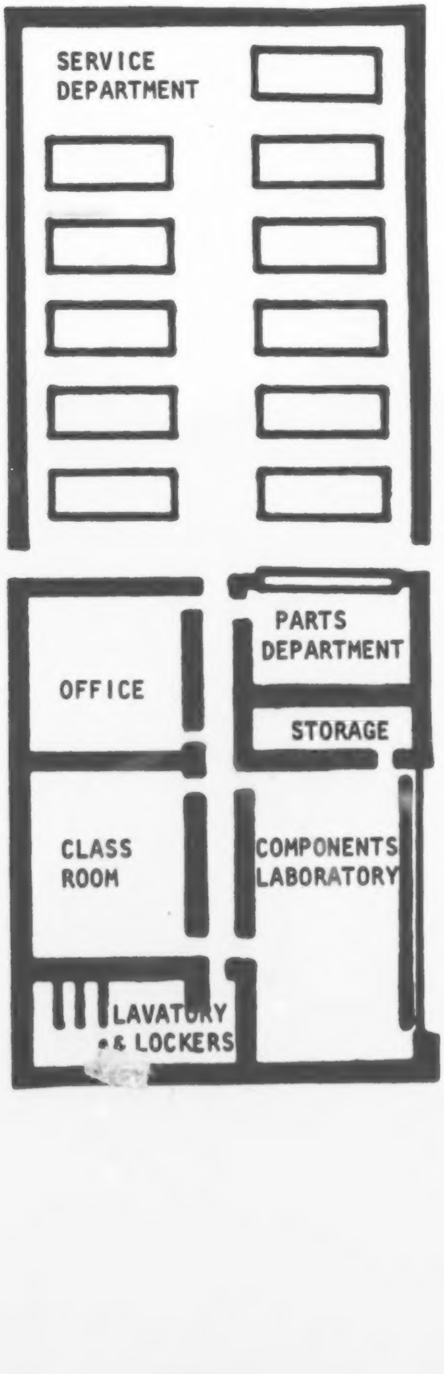
# Appendix A

## FACILITIES DIAGRAMS

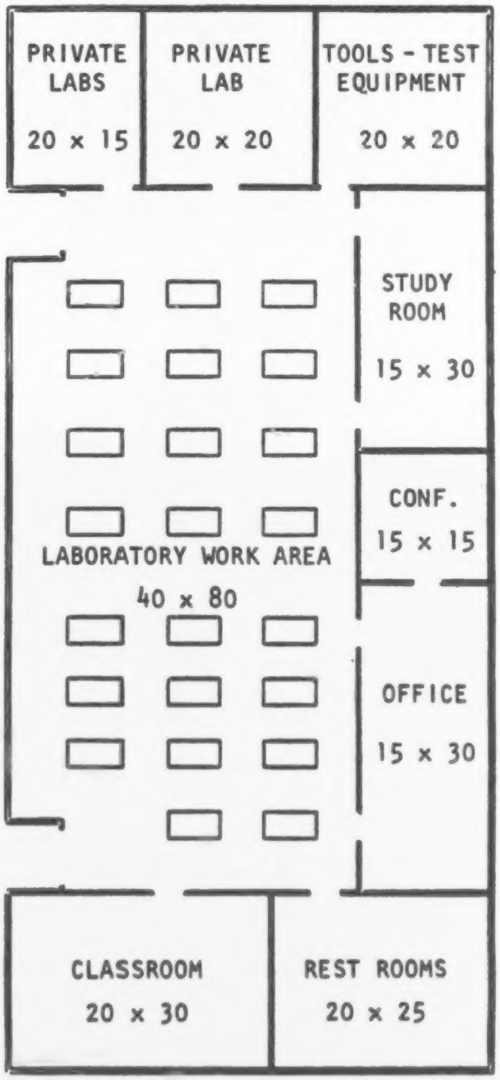
## SUGGESTED LAYOUT FOR A CLASSROOM


MULTI-MEDIA CARRELS
SLIDE AND MOTION PIC PROJECTION TABLE
2'-2" x 11'-4" TABLE
OVERHEAD PROJECTOR TABLE
DEMONSTRATION TABLE
PROJECTION SCREEN

## TYPICAL LABORATORY OR CLINICAL SETTING

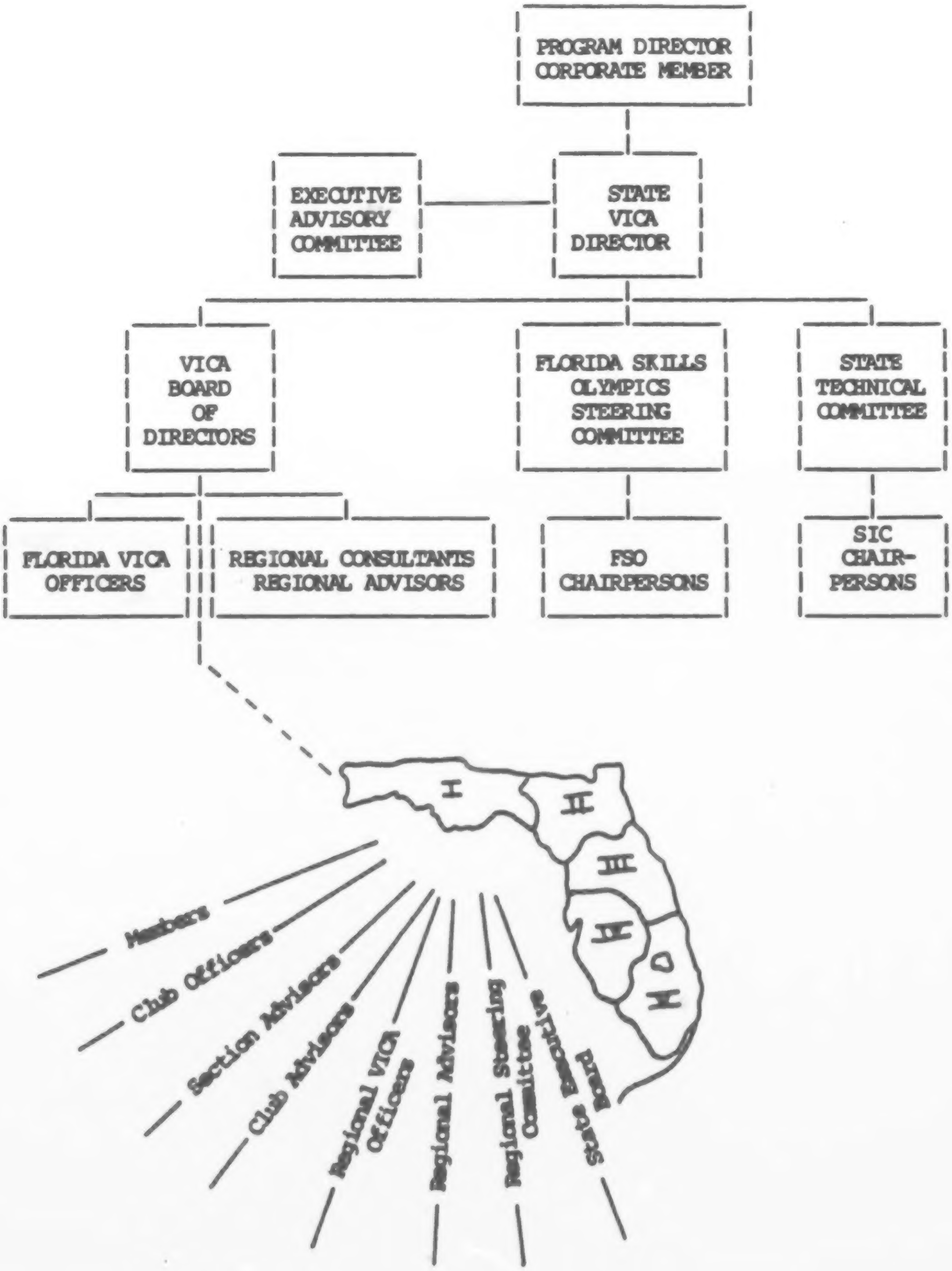

SERVICE DEPARTMENT
PARTS DEPARTMENT
OFFICE
STORAGE
CLASS ROOM
COMPONENTS LABORATORY
LAVATORY & LOCKERS

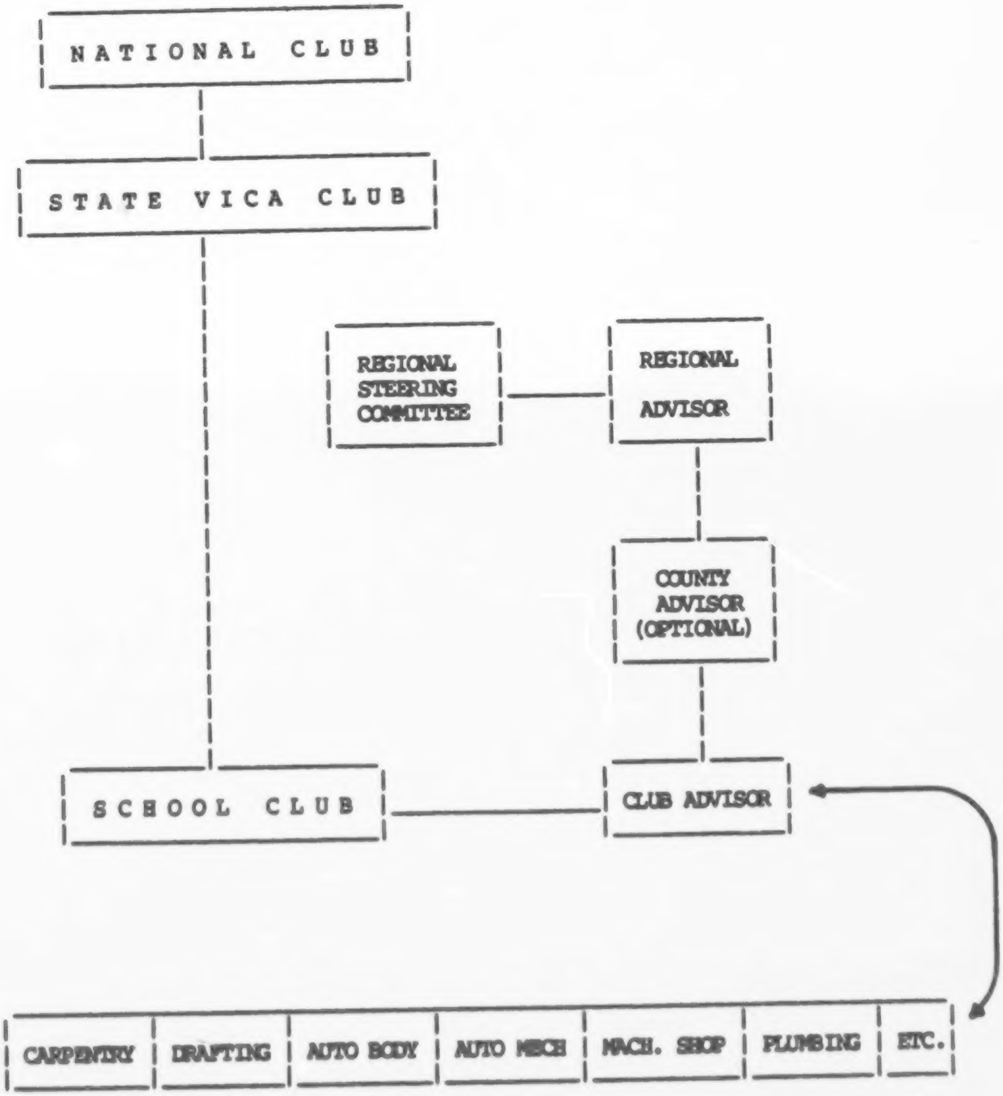
## TYPICAL COMBINATION OF CLASS/LAB AREAS


PRIVATE LABS
20 x 15
PRIVATE LAB
20 x 20
TOOLS - TEST EQUIPMENT
20 x 20
STUDY ROOM
15 x 30
CONF.
15 x 15
LABORATORY WORK AREA
40 x 80
OFFICE
15 x 30
CLASSROOM
20 x 30
REST ROOMS
20 x 25

# Appendix B

# VICA ORGANIZATION CHARTS


PROGRAM DIRECTOR
CORPORATE MEMBER
EXECUTIVE ADVISORY COMMITTEE
STATE VICA DIRECTOR
VICA BOARD OF DIRECTORS
FLORIDA SKILLS OLYMPICS STEERING COMMITTEE
STATE TECHNICAL COMMITTEE
FLORIDA VICA OFFICERS
REGIONAL CONSULTANTS
REGIONAL ADVISORS
FSO CHAIRPERSONS
SIC CHAIR-PERSONS
I
II
III
IV
V
Members
Club Officers
Section Advisors
Club Advisors
Regional VICA Officers
Regional Advisors
Regional Steering Committee
State Executive Board


NATIONAL CLUB
STATE VICA CLUB
REGIONAL STEERING COMMITTEE
REGIONAL ADVISOR
COUNTY ADVISOR (OPTIONAL)
SCHOOL CLUB
CLUB ADVISOR
CARPENTRY
DRAFTING
AUTO BODY
AUTO MECH
MACH. SHOP
PLUMBING
ETC.

# Appendix C

# CURRICULUM FRAMEWORKS

# and

# STUDENT PERFORMANCE STANDARDS

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CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Basic Precision Machining

CODE NUMBER: Secondary 87540000 Postsecondary ______

Florida CIP IN48.052300

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SECONDARY SCHOOL CREDITS 6 COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

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APPLICABLE LEVELS(S): ___ 7-9 ___ 9-12 ___ Postsecondary Adult Vocational

___ Postsecondary Vocational X Other ( 10-12, 21 )

---

CERTIFICATION COVERAGE: MACH SHOP 7 METAL WORK @ 7 TOOL DIE @ 7

---

I. **MAJOR CONCEPTS/CONTENT**: The purpose of this program is to prepare students for employment as filers (705.484-010), buffers (603.382-010), lay out workers (600.281-018), cut off saw operators (607.682-010), drill press operators (606.682-014), or lathe operators (604.280-010).

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, use of shop math and blueprints to produce machine parts to required size, bench work, precision measurement, and layout.

Listed below are the courses that comprise this program when offered at the secondary level:

| | |
|---|---|
| 8754010 | Basic Precision Machining 1 |
| 8754020 | Basic Precision Machining 2 |
| 8754030 | Basic Precision Machining 3 |
| 8754040 | Basic Precision Machining 4 |
| 8754050 | Basic Precision Machining 5 |
| 8754060 | Basic Precision Machining 6 |

II. **LABORATORY ACTIVITIES**: Shop or laboratory activities are an integral part of this program and include the set-up and operation of power saws, lathes, milling machines, drill presses, and pedestal and surface grinders.

Basic Precision Machining - Continued

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work perfomed.

When the cooperative education method of instruction is used, the program length for the secondary program may be increased by a maximum of 2.0 credits.

The typical length of this program for the average achieving student is 900 contact hours (1080 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the student will be able to:

01. Perform prerequisite machining skills.
02. Perform bench work skills.
03. Set up and operate power saws.
04. Set up and operate pedestal grinders.
05. Set up and operate drill presses.
06. Set up and operate lathes.
07. Set up and operate milling machines.
08. Set up and operate grinding machines.
09. Demonstrate employability skills.

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1986
PROGRAM AREA: Industrial COURSE CREDIT: 1
PROGRAM TITLE: Basic Precision Machining PROGRAM NUMBER: 8754000
COURSE TITLE: Basic Precision Machining 1 COURSE NUMBER: 8754010

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for performing prerequisite machining skills.

01.0 PERFORM PREREQUISITE MACHINING SKILLS--The student will be able to:

01.1 Demonstrate Proficiency in Immediate Work Area Maintenance

01.101 Dispose of scrap metal chips, shavings, trash and waste.
01.102 Clean and maintain work areas affected by operations.
01.103 Leave area in safe condition.
01.104 Comply with shop safety rules and practices.
01.105 Comply with shop operating rules and practices.
01.106 Participate in "clean up" of work and shop areas.
01.107 Maintain a clean and orderly shop.

01.2 Perform Mathematical Calculations

01.201 Make job-related decimal and fraction calculations.
01.202 Solve job-related problems by adding, subtracting, multiplying, and dividing numbers.
01.203 Solve job-related problems using a hand-held calculator.
01.204 Solve job-related problems using basic formulas.
01.205 Solve job-related problems using basic geometry.
01.206 Measure a workpiece and compare measurements with blueprint specifications.
01.207 Calculate the amount of material that should be removed to obtain correct limits for secondary operations.
01.208 Solve job-related problems using mathematical handbooks, charts, and tables.
01.209 Convert measurements from English to metric and from metric to English units.
01.210 Determine the clearance, relief, and rake of cutting tools.
01.211 Calculate machine speeds and feeds using appropriate formulas.

01.3 Demonstrate Proficiency in Blueprint Reading and Machine Planning

01.301 Interpret view concepts.
01.302 Read lines.
01.303 Read and interpret title blocks.

Basic Precision Machining 1 - Continued

01.304 Read and interpret change orders on working and assembly prints.
01.305 Read and interpret abbreviations.
01.306 Make shop sketches.
01.307 Read and interpret blueprints, including geometric tolerancing.
01.308 Determine and interpret reference information used in performing machine work.
01.309 Perform layout for precision machine work by using layout instruments.
01.310 Lay out radial and bolt hole circles.
01.311 Inspect, remove, and replace manufactured parts that need repair or machine work.
01.312 Select the most productive tool and tooling for a given operation.

### 01.4 Perform Measuring Operations

01.401 Read and measure with rules and calipers.
01.402 Read and measure with micrometers.
01.403 Read and measure with vernier tools.
01.404 Read and measure with dial indicators.
01.405 Measure with surface plates.

### 01.5 Perform Maintenance On Machines and Tools

01.501 Lubricate equipment parts.
01.502 Clean and store hand tools, cutters, fixtures, jigs, and attachments.
01.503 Inspect and repair hand tools.
01.504 Inspect drive pulleys or belts.
01.505 Select lubricants for machining operations.
01.506 Inspect equipment for safe operational conditions.
01.507 Store grinding wheels.
01.508 Store precision tools.
01.509 Inspect and adjust machine guards.
01.510 Inspect work areas to assure a safe working environment.

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STUDENT PERFORMANCE STANDARDS
EFFECTIVE DATE: July, 1986
PROGRAM AREA: Industrial
COURSE CREDIT: 1
PROGRAM TITLE: Basic Precision Machining
PROGRAM NUMBER: 8754000
COURSE TITLE: Basic Precision Machining 2
COURSE NUMBER: 8754020

Basic Precision Machining 2 - Continued

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for performing bench work skills and in setting up and operating power saws.

02.0 PERFORM BENCH WORK SKILLS--The student will be able to:

02.001 Cut materials by using hand hacksaws.
02.002 Cut threads by using hand taps.
02.003 Cut threads by using dies.
02.004 Ream holes by using hand reamers.
02.005 Hand-sharpen cutting tools by using abrasive stones.
02.006 Hone and lap surfaces.
02.007 Remove damaged screws and other hardware.
02.008 Set up and use arbor press broaches.
02.009 Deburr workpieces.

03.0 SET UP AND OPERATE POWER SAWS--The student will be able to:

03.001 Remove and replace saw blades.
03.002 Select appropriate blades to perform given sawing operations.
03.003 Select and set speeds and feeds for given sawing operations.
03.004 Measure and cut off material using a power saw.
03.005 Saw to scribed lines by using a metal band saw.
03.006 Cut and weld band saw blades to insert for contour sawing.
03.007 Set up and operate saws for angular cutting.

---

STUDENT PERFORMANCE STANDARDS
EFFECTIVE DATE: July, 1986
PROGRAM AREA: Industrial
COURSE CREDIT: 1
PROGRAM TITLE: Basic Precision Machining
PROGRAM NUMBER: 8754000
COURSE TITLE: Basic Precision Machining 3
COURSE NUMBER: 8754030

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for setting up and operating pedestal grinders and drill presses.

04.0 SET UP AND OPERATE PEDESTAL GRINDERS--The student will be able to:

04.001 Comply with safe and efficient work practices.
04.002 Identify the parts of the machine and explain their use.

Basic Precision Machining 3 - Continued

04.003 Set up support rests.
04.004 Dress grinding wheels.
04.005 Grind lathe tools to required angles.
04.006 Sharpen drills.

05.0 SET UP AND OPERATE DRILL PRESSES--The student will be able to:

05.001 Identify the parts of the machine and explain their use.
05.002 Identify and set the machine controls.
05.003 Comply with safe and efficient work practices.
05.004 Select the proper tooling.
05.005 Set up for and perform hole work, center drill, drill, ream, counter-sink, counterbore, and power tapping.
05.006 Set drill presses for proper feeds and speeds for specified operations.

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STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1986

PROGRAM AREA: Industrial COURSE CREDIT: 1

PROGRAM TITLE: Basic Precision Machining PROGRAM NUMBER: 8754000

COURSE TITLE: Basic Precision Machining 4 COURSE NUMBER: 8754040

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for setting up and operating lathes.

06.0 SET UP AND OPERATE LATHES--The student will be able to:

06.001 Identify the parts of the machine and explain their use.
06.002 Comply with general safe and efficient work practices.
06.003 Measure stock.
06.004 Set up an engine lathe.
06.005 Secure tools, tool-holders, and fixtures or attachments.
06.006 Select and set feeds and speeds.
06.007 Set up lathes and face workpieces held in chucks.
06.008 Rough-cut and finish-cut with lathes.
06.009 Perform lathe filing to deburr parts.
06.010 Align lathe centers using accurate methods.
06.011 Drill holes with lathes.
06.012 Countersink holes with lathes.
06.013 Ream holes with lathes.
06.014 Tap threads with lathes.

Basic Precision Machining 4 - Continued

06.015 Die-cut threads with lathes.
06.016 Counterbore holes with lathes.
06.017 Bore holes with lathes.
06.018 Knurl parts with lathes.
06.019 Cut external threads with lathes.
06.020 Rechase threads with lathes.
06.021 Cut internal threads with lathes.
06.022 Set up and perform taper turning with taper attachments.
06.023 Set up and perform taper turning with the compound.
06.024 Cut internal tapered surfaces.
06.025 Set up and operate tool post grinders.
06.026 Perform contour, angular, or radial cuts with lathes.
06.027 Set up and use follow- and steady-rests.
06.028 Set up face plates and dogs.

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STUDENT PERFORMANCE STANDARDS

EFFECTIVE DATE: July, 1986

PROGRAM AREA: Industrial

COURSE CREDIT: 1

PROGRAM TITLE: Basic Precision Machining

PROGRAM NUMBER: 8754000

COURSE TITLE: Basic Precision Machining 5

COURSE NUMBER: 8754050

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for setting up and operating milling machines.

07.0 SET UP AND OPERATE MILLING MACHINES--The student will be able to:

07.001 Identify the parts of the horizontal and vertical machine and explain their use.
07.002 Comply with safe and efficient work practices.
07.003 True up the head and align milling machine fixtures.
07.004 Select and set feeds and speeds for milling work.
07.005 Square up workpieces with a table vise.
07.006 Perform end milling.
07.007 Perform fly-cutting operations.
07.008 Drill holes with milling machines.
07.009 Perform reaming operations.
07.010 Cut external keyways.
07.011 Bore holes with milling machines.
07.012 Perform form milling.
07.013 Perform indexing operations using a dividing head.
07.014 Set up and operate rotary tables.

Basic Precision Machining 5 - Continued

07.015 Mill cylindrical work.
07.016 Mill an external radius.
07.017 Mill an angle.
07.018 Align milling machine attachments.
07.019 Mill internal slots with a slotter and attachment.
07.020 Perform cutting-off operations.
07.021 Set up and perform slab mill operations.
07.022 Use an edge finder and wiggler.
07.023 Use digital readouts.

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STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1986

PROGRAM AREA: Industrial COURSE CREDIT: 1

PROGRAM TITLE: Basic Precision Machining PROGRAM NUMBER: 8754000

COURSE TITLE: Basic Precision Machining 6 COURSE NUMBER: 8754060

COURSE DESCRIPTION:

This course is designed to provide instruction in the different procedures for setting up and operating grinding machines and demonstrating employability skills.

08.0 SET UP AND OPERATE GRINDING MACHINES--The student will be able to:

08.001 Identify the parts of the machine and explain their use.
08.002 Comply with safe and efficient work practices.
08.003 Select the proper wheel.
08.004 Inspect, balance, dress, and true, grinding wheels.
08.005 Attach and align workpieces for grinding operations.
08.006 Set up and grind parallel flat surfaces.
08.007 Set up and grind four sides square.
08.008 Set up and use angle plates.

09.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

09.001 Conduct a job search.
09.002 Secure information about a job.
09.003 Identify documents that may be required when applying for a job.
09.004 Complete a job application form correctly.
09.005 Demonstrate competence in job interview techniques.
09.006 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.

Basic Precision Machining 6 - Continued

09.007 Identify acceptable work habits.
09.008 Demonstrate knowledge of how to make job changes appropriately.
09.009 Demonstrate acceptable employee health habits.

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CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Precision Machining

CODE NUMBER: Secondary ___ Postsecondary MTR0470

Florida CIP IN48.050300

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SECONDARY SCHOOL CREDITS ___ COLLEGE CREDITS ___ POSTSECONDARY ADULT VOCATIONAL CREDITS ___

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APPLICABLE LEVELS(S): ___ 7-9 ___ 9-12 ___ Postsecondary Adult Vocational

___ Postsecondary Vocational X Other ( 13-17)

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CERTIFICATION COVERAGE: MACH SHOP 7 TOOL DIE @ 7 METAL WORK @ 7

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I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as machinists (600.280-022), filers (705.484-010), grinders (603.280-018), buffers (603.382-010), lay out workers (600.281-018), cut off saw operators (607.682-010), drill press operators (606.682-014), lathe operators (604.280-010), mill operators (605.685-030), E.D.M. operators (609.482-010), C.N.C. machine operators (609.662-010), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, shop math and blueprints, shaping metal parts to required size, bench work, precision measurement, layout, and inspection.

II. LABORATORY ACTIVITIES: Machine shop laboratory activities are an integral part of this course and include the set-up and operation of grinders, buffers, cut off saws, drill presses, lathes, milling machines, electrical discharge (E.D.M.) machines, and machines with computerized numerical controls.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and for reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

Basic Precision Machining - Continued

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Section 233.0695F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the student will be able to:

01. Perform prerequisite machining skills
02. Perform bench work skills
03. Set up and operate power saws
04. Set up and operate pedestal grinders
05. Set up and operate drill presses
06. Set up and operate lathes
07. Set up and operate milling machines
08. Set up and operate grinding machines
09. Set up and operate tool machines and cutters
10. Apply computerized numerical control operations skills
11. Set up and operate EDM machines
12. Set up and operate heat treat furnaces
13. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: July, 1986
PROGRAM AREA: Industrial Education SECONDARY NUMBER: ________
PROGRAM TITLE: Precision Machining POSTSECONDARY NUMBER: MTR0470

01.0 PERFORM PREREQUISITE MACHINING SKILLS--The student will be able to:

01.1 Demonstrate Proficiency in Maintaining Immediate Work Area

01.101 Dispose of scrap metal chips, shavings, trash and waste
01.102 Clean and maintain work areas affected by operations
01.103 Leave area in safe condition
01.104 Comply with shop safety rules and practices
01.105 Comply with shop operating rules and practices
01.106 Participate in "clean up" of work and shop areas
01.107 Maintain a clean and orderly shop

01.2 Perform Mathematical Calculations

01.201 Make job-related decimal and fraction calculations
01.202 Solve job-related problems by adding, subtracting, multiplying, and dividing numbers
01.203 Solve job-related problems using a hand-held calculator
01.204 Solve job-related problems using basic formulas
01.205 Solve job-related problems using basic geometry
01.206 Solve job-related problems using basic trigonometry
01.207 Measure a workpiece and compare measurements with blueprint specifications
01.208 Calculate the amount of material that should be removed to obtain correct limits for secondary operations
01.209 Solve job-related problems using mathematical handbooks, charts, and tables
01.210 Convert measurements from English to metric and from metric to English units
01.211 Determine the clearance, relief, and rake of cutting tools
01.212 Calculate machine speed and feed by using appropriate formulas

01.3 Demonstrate Proficiency in Blueprint Reading and Machine Planning

01.301 Interpret view concepts
01.302 Read lines
01.303 Apply principles of dimensioning
01.304 Apply principles of tolerance expressions
01.305 Read and interpret title blocks
01.306 Read and interpret change orders on working and assembly prints
01.307 Read and interpret abbreviations
01.308 Make shop sketches
01.309 Read and interpret blueprints, including geometric tolerancing

Basic Precision Machining - Continued

01.310 Determine and interpret reference information used in performing machine work
01.311 Perform layout for precision machine work by using layout instruments
01.312 Lay out radii and bolt hole circles
01.313 Inspect, remove, and replace manufactured parts that need repair or machine work
01.314 Select the most productive tool and tooling for a given operation

### 01.4 Perform Measuring Operations

01.401 Read and measure with rules and calipers
01.402 Read and measure with micrometers
01.403 Read and measure with vernier tools
01.404 Read and measure with dial indicators
01.405 Measure with surface plates
01.406 Read and measure with gauge blocks and adjustable gauges
01.407 Measure with sine bars
01.408 Take readings with hardness testers
01.409 Take readings with optical comparators
01.410 Inspect finished products

### 01.5 Perform Maintenance On Machines and Tools

01.501 Lubricate equipment parts
01.502 Clean and store hand tools, cutters, fixtures, jigs, and attachments
01.503 Inspect and repair hand tools
01.504 Inspect drive pulleys or belts
01.505 Select lubricants for machining operations
01.506 Inspect equipment for safe operational conditions
01.507 Store grinding wheels
01.508 Store precision tools
01.509 Inspect and adjust machine guards
01.510 Inspect work areas to assure a safe working environment

02.0 PERFORM BENCH WORK SKILLS--The student will be able to:

02.001 Cut materials by using hand hacksaws
02.002 Cut threads by using hand taps
02.003 Cut threads by using dies
02.004 Ream holes by using hand reamers
02.005 Hand-sharpen cutting tools by using abrasive stones
02.006 Hone and lap surfaces
02.007 Remove damaged screws and other hardware
02.008 Set up and use arbor press broaches
02.009 Deburr workpieces

Basic Precision Machining - Continued

03.0 SET UP AND OPERATE POWER SAWS--The student will be able to:

03.001 Remove and replace saw blades
03.002 Select appropriate blades to perform given sawing operations
03.003 Select and set speeds and feeds for given sawing operations
03.004 Measure and cut off material using a power saw
03.005 Saw to scribed lines by using a metal band saw
03.006 Cut and weld band saw blades to insert for contour sawing
03.007 Set up and operate saws for angular cutting

04.0 SET UP AND OPERATE PEDESTAL GRINDERS--The student will be able to:

04.001 Comply with safe and efficient practices
04.002 Identify the parts of the machine and explain their use
04.003 Set up support rests
04.004 Dress grinding wheels
04.005 Grind lathe tools to required angles
04.006 Sharpen drills

05.0 SET UP AND OPERATE DRILL PRESSES--The student will be able to:

05.001 Identify the parts of the machine and explain their use
05.002 Identify and set the machine controls
05.003 Comply with safe and efficient work practices
05.004 Select the proper tooling
05.005 Set up and operate for hole work, center drill, drill, ream, counter-sink, counterbore, and power tapping
05.006 Set drill presses for proper feed and speed for specified operations

06.0 SET UP AND OPERATE LATHES--The student will be able to:

06.001 Identify the parts of the machine and explain their use
06.002 Comply with general safe and efficient work practices
06.003 Measure stock
06.004 Set up an engine lathe
06.005 Secure tools, tool-holders, and fixtures or attachments
06.006 Select and set feeds and speeds
06.007 Set up lathes and face workpieces held in chucks
06.008 Rough-cut and finish-cut with lathes
06.009 Perform lathe filing to deburr parts
06.010 Align lathe centers using accurate methods
06.011 Drill holes with lathes
06.012 Countersink holes with lathes
06.013 Ream holes with lathes
06.014 Tap threads with lathes
06.015 Die-cut threads with lathes
06.016 Counterbore holes with lathes
06.017 Bore holes with lathes

Basic Precision Machining - Continued

06.018 Knurl parts with lathes
06.019 Cut external threads with lathes
06.020 Rechase threads with lathes
06.021 Cut internal threads with lathes
06.022 Set up and perform taper turning with taper attachments
06.023 Set up and perform taper turning with the compound
06.024 Cut internal tapered surfaces
06.025 Set up and operate tool post grinders
06.026 Perform contour, angular, or radii cuts with lathes
06.027 Set up and use follow- and steady-rests
06.028 Set up face plates and dogs

07.0 SET UP AND OPERATE MILLING MACHINES--The student will be able to:

07.001 Identify the parts of the horizontal and vertical machine and explain their use
07.002 Comply with safe and efficient work practices
07.003 True up the head and align milling machine fixtures
07.004 Select and set feeds and speeds for milling work
07.005 Square up workpieces with a table vise
07.006 Perform end milling
07.007 Perform fly-cutting operations
07.008 Drill holes with milling machines
07.009 Perform reaming operations
07.010 Cut external keyways
07.011 Bore holes with milling machines
07.012 Perform form milling
07.013 Perform indexing operations using a dividing head
07.014 Set up and operate rotary tables
07.015 Mill cylindrical work
07.016 Mill an external radius
07.017 Mill an angle
07.018 Align milling machine attachments
07.019 Mill internal slots with a slotter and attachment
07.020 Perform cutting-off operations
07.021 Perform straddle milling operations on the horizontal mill
07.022 Set up and perform slab mill operations
07.023 Use an edge finder and wiggler
07.024 Use digital readouts

08.0 SET UP AND OPERATE GRINDING MACHINES--The student will be able to:

08.001 Identify the parts of the machine and explain their use
08.002 Comply with safe and efficient work practices
08.003 Select the proper wheel
08.004 Inspect, balance, dress, and true, grinding wheels
08.005 Select and set feeds and speeds of power-feed grinders
08.006 Attach and align workpieces for grinding operations
08.007 Cut off or part workpieces with grinding machines

Basic Precision Machining - Continued

08.008 Set up and grind parallel flat surfaces
08.009 Set up and grind four sides square
08.010 Set up grinders to run workpieces between centers
08.011 Measure, inspect, and rework workpieces on grinding machines
08.012 Set up, grind, and sharpen preshaped lathe tools
08.013 Set up and use radius dressers
08.014 Set up and use angle plates
08.015 Operate cyclindrical grinders
08.016 Grind to a shoulder
08.017 Grind a taper
08.018 Set up and operate I/O grinders (optional)

09.0 SET UP AND OPERATE TOOL MACHINES AND CUTTERS--The student will be able to:

09.001 Identify the parts of the machine and explain their use
09.002 Identify and select proper machine controls
09.003 Comply with safe and efficient work practices
09.004 Select proper work holding devices
09.005 Perform truing, dressing, and forming operations to blueprint specifications
09.006 Compute proper speeds
09.007 Sharpen an end mill
09.008 Sharpen a horizontal milling cutter

10.0 APPLY COMPUTERIZED NUMERICAL CONTROL OPERATIONS SKILLS--The student will be able to:

10.001 Identify the parts of the machine and explain their use
10.002 Identify and select proper machine controls
10.003 Comply with safe and efficient work practices
10.004 Write a basic program and apply basic programming skills
10.005 Select proper work holders
10.006 Select proper cutting tools
10.007 Machine parts to blueprint tolerances

11.0 SET UP AND OPERATE EDM MACHINES--The student will be able to:

11.001 Identify the parts of the machine and explain their use
11.002 Identify and select proper machine controls
11.003 Comply with safe and efficient work practices
11.004 Select proper work holding devices
11.005 Select and use proper power supply settings
11.006 Select and use the proper electrode material and dielectric fluid
11.007 Calculate the proper electrode size for the operation to be performed

Basic Precision Machining - Continued

12.0 SET UP AND OPERATE HEAT TREAT FURNACES--The student will be able to:

12.001 Identify the parts of the machine and explain their use
12.002 Identify and select proper machine controls
12.003 Comply with safe and efficient work practices
12.004 Select and identify proper heat treatment processes
12.005 Perform a basic heat treatment process to blueprint specifications

13.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

13.001 Conduct a job search.
13.002 Secure information about a job.
13.003 Identify documents that may be required when applying for a job.
13.004 Complete a job application form correctly.
13.005 Demonstrate competence in job interview techniques.
13.006 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.
13.007 Identify acceptable work habits.
13.008 Demonstrate knowledge of how to make job changes appropriately.
13.009 Demonstrate acceptable employee health habits.

State of Florida
Department of Education
Ralph D. Turlington, Commissioner of Education
Tallahassee, Florida
Affirmative action/equal opportunity employer

*Division of Vocational, Adult, and Community Education*

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